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# REPORT

**Medical-Biological, Epidemiological, Dosimetrical, Computer-Informational, Administrational Activities for Implementation of Joint BelAm Scientific Protocol for the Studies of Thyroid Cancer and Other Thyroid Diseases in Belarus Following the Chernobyl Accident in the Framework of Invoice for the period of 01.01.1999 - 31.03.1999**

| | |
|---|---|
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**MINSK, 1999**

Rec'd 4 June 1999

**Task No. 1: The management and administration of the BelAm Thyroid Study.**

**Milestone 1: Weekly meetings with the group leaders to discuss and record the progress of the Project and their reflection in the minutes.**

***(Administrative group)***

During the first quarter Administrative Group has performed 12 meetings with Group Leaders were they reported about task implementation for the quarter. All scheduled measures have been performed.

Special meeting was dedicated to the quarter report preparation. It was recommended to reflect in dynamics the data characterizing searching activity, cohort selection, and examination of subjects starting 01.01.1997.

During meetings questions have been discussed related to plan of project activity for 1999. The plan have been worked out and adopted by the Project Director.

The following questions have been also discussed:

1. Individual reports for the quarter.
2. Verified schedule for materials and supplies. The schedule was sent to NCI.
3. Cooperation with mass media. Information and articles for publishing were sent to local newspaper of Khojniki, Bragin, and Kostukovichi rajons.
4. Equipment fixing up. Probe for recording of ultrasound thyroid images has been fixed up.
5. Cooperation with ICTC. All the documents have been sent to NCI.
6. Mobile team activity. In the 1 quarter mobile team worked in Khojniki, Bragin, and Kostukovichi rajons.
7. Changes to Manual of Operations. Necessary changes have been made.
8. Functional responsibilities for personnel of the Project. For each member of the Project functional responsibilities have been worked out.
9. IRB meeting. Joint meeting of IRB members and Group Leaders was held in March.
10. Arrangement of screening activity in Gomel. It was planed to start screening examination of subjects in May.

The questions related to cohort subjects locating, materials and supplies purchasing, cooperation with U.S. experts have been also discussed during weekly meetings.

**Milestone 2: Administrative support of cohort establishment to supply access to various informational sources, especially sources of address information.**

***(Administrative group)***

For the reported period administrative support was given to the process of getting address information from Address Office of Mogilev. It concerned individuals moved to new places of residence following Chernobyl accident. Information on 300 inds. Have been received.

Administrative group made attempts to find funds to cover field trips costs. These costs have been paid to 11 specialists who spent in field 35 days.

National Dispensary of Radiation Medicine gave its vehicle for 5 field trips which brought subjects to examination from nearby villages for 35 days.

Ministry of Health, Republic of Belarus, gave instructions to Medical Directors of Khojniki, Bragin, and Kostukovichi Central Regional Hospitals to arrange the activity of the mobile team in their hospitals.

**Milestone 3: Coordination between Belarus and U.S. participants with respect to all activities of the Project.**

*(Administrative group)*

Coordination of activities with U.S. colleagues was performed in the following fields:

1. Staff situation. Information regarding appointment of Quality Control Officer and Director of RCIRME have been sent to NCI.
2. Arrangement of U.S. experts work in groups and meetings with group leaders from Belarus side.
3. Invitation for Dr. Voilleque have been sent for obtaining visa
4. Arrangement of meeting in Kiev. Representatives of Chernobyl Register and Cancer Register participated in the work of the Meeting.
5. Arrangement of multiple visas. A letter was prepared to the Foreign Office, Republic of Belarus, asking for multiple visas issuing for all U.S. experts.
6. Fixing of equipment. Money was received from NCI for fixing of probe for ultrasound unit. Probe has been fixed, bill has been sent to NCI.
7. Reagents shipments. Cooperation with Brahms (Germany).
8. Car rent. Grounds for car rent costs have been prepared.
9. Preparation of the paper on the screening findings.

**Task No. 2: The establishment of the cohort of subjects for study.**

**Milestone 4: Work to locate provisional cohort of 15.000 and select at least 1.000 accessible to the Minsk Dispensary**

*(Data Coordinating Center)*
*(Epidemiology Group)*

In order to establish the study cohort in the first quarter 1999 DCC performed second randomization. Amount of the second randomized sample was determined basing on the number of addresses not located in the course of search - 4,281 inds. According to the protocol the ratio between middle dose- and low dose groups should be 2/3. That is why 3,300 inds. were added to middle dose group after randomization and 1,000 inds. - to low dose group. Considering the first randomization it was received 4,500 inds. in low dose group, 6,800 inds. in middle dose group and 8,453 inds. in high dose group. All in all at present the number of provisional cohort subjects for search and screening examination is 19,735 inds.

To locate 4,400 newly selected provisional subjects computer linkage was performed through the following sources:

- Local data bases (Policlinics ## 31 and 25, WHO DB, Sasakava DB, National Dispensary of radiation Medicine) - 26 provisional addresses were found.
- Data base of direct measurements (complete addresses in Minsk and Gomel cities) - 204 provisional addresses were found.

- Chernobyl Registry - 853 provisional addresses were found
- Notification for evacuated subject - 17 inds.

Thus, as a result of the second randomized selection on the base of computer linkage 1,100 provisional addresses were found.

To locate the rest 3,200 inds. the lists have been created for Address Offices of Gomel, Mogilev and Minsk oblasts:

- Address Office of Minsk Oblast - 420 inds.
- Address Office of Gomel Oblast - 2,471 inds.
- Address Office of Mogilev Oblast - 309 inds.

Above mentioned lists were passed to epidemiology group for searching.

To maintain mobile team activity DCC have prepared bulks of information for sending invitations to the subjects and lists for verifying addresses and screening examination of the subjects having the following statuses:

- no response within a month
- reserve
- those who gave preliminary consent to be examined in the Dispensary but did not come there
- new address

in the following rajons :

-Bragin 26.01.1999 - 4.02.1999 - 710 inds.
-Costukovichi 10.02.1999 - 15.02. 1999 - 129 inds.
-Bragin 15.03.1999 - 29.03. 1999 - 392 inds.
-Khojniki 21.03.1999 - 26.03. 1999 - 641 inds.

Above mentioned lists were passed to epidemiology group for further mobile group activity. Epidemiologist together with mobile team arrived to Kostukovichi rajon,Khojniki rajon, and twice toBragin rajon. Besides to the screening center of Minsk Dispensary subjects have been invited who live in Minsk and children born 1983-1986 whose place of residence was found in Gomel Address Office through the places of registration of their mothers. Thus for the first quarter 2,540 informational letters with invitation to the examination have been mailed. The letters were sent to Bragin and Khojniki rajons of Gomel oblast and Kostukovichi rajon of Mogilev oblast, and Minsk city. Among all mailed letters 95% belong to the category of repeated letter with invitation to initial visit.

**Milestone 5: Determine current addresses of about 5,000 members of cohort for whom letters were sent and who did not respond.**

***(Epidemiology Group)***

To find out addresses of provisional subjects not responded to invitations, in January - March epidemiologist together with mobile team made trips to Mogilev and Gomel oblasts. In the course of mobile team activity epidemiologists arranged patients flow to screening examination, verified addresses of provisional cohort subject having epi status " no response within a month". Address verification was performed through two directions: through formal sources of information (village medical assistant stations, village Council, secretariat of town Council), and through personal contacts while visiting subjects' places. Table 1 presents the results of addresses verification for the subjects not responded to repeated invitations.

**Table1**

**Results of address verification for cohort subjects living in Bragin, Khojniki and Kostukovichi rajons**

| Rajon of living | Invited subjects | | | Address is confirmed | | Address is not confirmed | | No information |
|---|---|---|---|---|---|---|---|---|
| | total | Including "no response." | | abs | % | abs | % | % |
| | | abs | % | | | | | |
| Bragin | 710 | 627 | 88,2 | 326 | 52 | 120 | 19 | 29 |
| Khojniki | 641 | 567 | 88,4 | 260 | 46 | 126 | 22 | 32 |
| Kostukovichi | 129 | 111 | 86,0 | 36 | 32 | 52 | 47 | 21 |
| Total | 1480 | 1305 | 88,1 | 622 | 48 | 298 | 23 | 29 |

*) Did not come to examination that is why it is impossible to make a conclusion whether the address is right or wrong.

**Milestone 6: Determine the location of geographical areas with high numbers of people with identified current addresses for possible examination by mobile teams**

***(Epidemiology Group)***

In the first quarter three rajons (Bragin and Khojniki of Gomel oblast, and Kostukovichi of Mogilev oblast) have been selected. In this rajons the majority of provisional subjects live who have verified addresses and who did not come to examination to Minsk Dispensary after repeated invitations. Mobile team was sent to these rajons to perform examination in field. The task of epidemiologists was to verify addresses and maintain patients flow to screening examination. To fulfill this task in Bragin rajon epi group performed the following activity: visited medical assistant stations in the villages of Shcuraty, Mikulichy, Kononovschina, Ugly, hospital in Krivchany village, Village Counsil of Bakunov, Bragin school, communicated with Director of Asarevichi Collective Farm, and Policlinic of Komarin town.At the same time they visited the subjects places in Bragin. From 150 addresses epidemiologists visited 149, 34 of them - twice. Subjects from the villages of Mikulichi, Stezhernoe, Burki, Kovali, Kononovschina, Ryzhkov, Zarechie, Perenocy, Malejki, Krivcha, Bakuny, Dublin, Golubovka, Chemirisy, town of Komarin have been transported to the place of examination (Bragin Central Regional Hospital) by the van of mobile team in accompany of epi group representative. From the villages of Ugly, Khrakovichi, Rudnia-Zhuravleva transportation of subjects was arranged by local authorities and schools. In Khojniki rajon the methods of operation were similar: explanatory work among physicians and medical staff, schools administration, visits to subjects' places in the town of Khojniki. Subjects from the villages of Sudkovo, Kozeluzhie, Poselichi, Dvorische, Malishev, Strelichevo have been transported to the examination by the van of mobile team. In the town of Khojniki epidemiologists visited 400 places of subjects' residence from 500 they had in their list. In Kostukovichi rajon at the initial contact with administration of Central Regional Hospital it was revealed that from 129 inds. selected for examination by the mobile team 52 moved out of the rajon. That is why stress was made to visits of subjects' places (22 inds.).

Efficiency of epidemiologists activity in maintaining patients flow to screening examination performed by mobile team is presented in Table 2

**Table 2**

**Efficiency of epidemiologists activity in maintain patients flow to screening examination performed by mobile team**

| Place of mobile team activity | Quantity of mailed letters | Examined | | Attendance to examination | | | |
|---|---|---|---|---|---|---|---|
| | | Abs. | % | By letter, without reminding | | After additional arrangements | |
| | | | | Abs | % | Abs | % |
| Bragin | 710 | 327 | 46 | 52 | 16 | 275 | 84 |
| Khojniki | 641 | 224 | 35 | 18 | 8 | 206 | 92 |
| Kostukovichi | 129 | 31 | 24 | 0 | 0 | 31 | 100 |
| Total | 1491 | 582 | 39,0 | 70 | 12,0 | 512 | 88,0 |

**Milestone 7: Create initial data base of exposed "in utero'**

***(Epidemiology Group)***

In the first quarter epi group continued to create an initial data base of "in utero"exposed children. by 01.04.99 DB contained information on 38,000 children, born from 26 April 1986 to 31 January 1987. Data entry for children born in Gomel oblast and Minsk city has been completed. For the reported quarter information on 10,000 children has been keyed.

**Task 3. The invitation and scheduling of subjects for endocrinologic examination**

**Milestone 9: Preparation of the letters of invitation, software and procedures for inviting and scheduling subjects for examination**

***(Epidemiology Group)***

For the first quarter 1999 a software has been completed that provides with data flows from the group "no response within a month". We faced with the necessity to work with concrete oblasts and rajons. For this purpose a possibility of automatic data selection according to the place of residence was implemented. It gave more flexible and effective approach for work with this group to attract provisional cohort subjects to examination.

A software has been also completed which provide with preparation and mailing of appointment letters for mobile team. An option has been implemented for automatic adding of data from the groups "no response within a month", "reserve", those who gave preliminary consent but did not come to screening examination for the previous period of time, and sending letters to them

*(Epi Group)*

2,540 informational letters with invitation to examination was sent for the first quarter. More than 95% of them are repeated letters with invitation to initial screening. Among them 1871 letters contain invitation to examination performed by mobile team and 669 letters invitation to Screening Center of Minsk Dispensary.

In January subjects living in Bragin rajon were invited to examination. Totally 435

appointment letters have been sent including 398 for initial visit and 37 for follow up. One subject was invited to Minsk Dispensary.

In February subjects were invited to be examined by mobile team in Central Regional Hospital of Bragin (275 letters), Central Regional Hospital of Kostukovichi (129 letters) and in the Screening Center of Minsk Dispensary (38 letters). Totally 442 appointment letters have been sent including 413 for initial visit and 29 for follow up.

In March subjects were invited to be examined in Central Regional Hospitals of Bragin and Khojniki rajons of Gomel oblast (1032 letters) and in the Screening Center of Minsk Dispensary (630 letters). Totally 1662 appointment letters have been sent including 1450 for initial visit and 21 for follow up. General information about the number of mailed letters in the first quarter and their classification is presented in Table 3

**Table 3**

**Information of mailed letters to cohort subject**

| Month of visit (1999 ) | Number of mailed letters | Classification of appointments | | | |
|---|---|---|---|---|---|
| | | Initial visit | | Follow up visit | |
| | | Mobile team | Screening Center | Mobile team | Screening Center |
| January | 436 | 398 | 1 | 37 | - |
| February | 442 | 375 | 38 | 29 | - |
| March | 1662 | 1002 | 448 | 30 | 182 |
| Total | 2540 | 1775 | 487 | 96 | 182 |

From the data presented in the table it is evident that in the first quarter 1871 letters (73.7%) from the total number of 2540 falls on mobile team and 669 (26.4%) - Screening Center of Minsk Dispensary.

For the reported period 85 initial forms (demography) have been filled in and entered to the epidemiological DB, 1723 contact forms, 415 of them have been entered automatically.

**Task No. 4 The endocrinologic examination of subjects, including subsequent diagnostic procedures leading to the establishment of the final pathologic diagnosis.**

**Milestone 9: Screening up to 600 subjects in Minsk Dispensary, including the laboratory work.**

***(Screening Center)***

**Examination.** All in all for the reported period 764 subjects have been examined in the Screening Center. 585 (76.6%) for the first time and 179 (23.4%) repeated. Mobile team examined 583 (76.3% of all examined) subjects in Khojniki, Bragin and Kostukovichi.

Thyroid pathology has been revealed in 114 subjects (14.9%), in 65 inds. (8.5%) - for the first time. Distribution of patients according to diagnosis and type of visit is presented in Table 4.

As it is evident from the presented data among initially examined subjects in the first quarter one subject was found previously operated because of thyroid cancer (0.13% from 764). Thus, total number of thyroid cancers among examined part of the cohort became 42.

Nodular goiter was found for the first time in 29/764 ids. (3.8%). It should be noted 9"new" cases revealed in the course of repeated examination - 1.2% from all examined and 5% from subjects examined more than once. As it was previously nodular goiter dominates in the structure of thyroid pathology - 80.6% of all thyroid diseases revealed for the first time.

Based on clinical and ultrasound data of autoimmune thyroiditis was suspected in 2/264 subjects (0.26%)

Diffusive Goiter IB was initially diagnosed in 4/764 (0.5%) subjects.
Review of initially revealed pathology depending on the type of visit (initial or repeated) shows that 27.8% of cases were revealed in the course of the repeated visit. It means that it is necessary to perform scheduled follow up examinations in order to maintain the cohort.

44/764 subjects (5.8%) were referred to the Clinic of Acsacovschina.

2 subjects were referred to the Center of Thyroid Oncopathology, one of the was operated (nodular goiter).

Table 4.

**Distribution of thyroid pathology revealed during screening examination for the first 1999 according to the diagnosis and type of visit**

| Diagnosis | Initially revealed | | | Previously revealed | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 visit | Repeat | Total | 1 visit | Repeat | Total | 1 visit | Repeat | Total |
| Thyroid cancer | - | - | - | 1 | 8 | 9 | 1 | 8 | 9 |
| Nodular goiter | 20 | 9 | 29 | 21 | 28 | 49 | 41 | 37 | 78 |
| Nodular goiter? | - | 1 | 1 | - | - | - | - | 1 | 1 |
| AIT | - | - | - | 1 | 8 | 9 | 1 | 8 | 9 |
| AIT? | 2 | - | 2 | - | - | - | 2 | - | 2 |
| Goiter I | 4 | - | 4 | 5 | 5 | 10 | 9 | 5 | 14 |
| Aplasia of thyroid lobe | - | - | - | 1 | - | 1 | 1 | - | 1 |
| Total | 26 | 10 | 36 | 29 | 49 | 78 | 55 | 59 | 114 |

*(Central Laboratory)*

Amount of work of the Central Laboratory for

| | 1-st quarter 1999 project (by 31.03.99) | Totally for the (12.96-31.03.99) |
|---|---|---|
| Eexamined: | 755 subjects | 4613 subjects. |
| Collection of biological samples | | |
| filled forms of blood collection - | 755 | 4613 |
| taken blood samples: | 754 | 4584 |
| refused from blood collection: 1 | 29 | |
| filled forms for urine collection: | 755 | 4613 |
| Taken urine samples : | 751 | 4578 |
| Refused from urine collection: | 4 | 35 |
| Performed tests: | | |
| 1. Content of TSH hormone- | 434 | 2044 |
| 2. Content of ionized Calcium- | 756 | 3562 |
| 3. Content of Iodine in urine - | 750 | 4258 |
| 4. Content of antibodies to TG - | 671 | 1434 (for the 4-th quarter 1998 and 1 quarter.1999) among them repeated tests for: 90 subjects. |
| 5. Content of antibodies to TPO -) | 671 | 1465 (for the 4-th quarter 1998 and 1-st quarter 1999) among them repeated tests for 129 subjects |
| 6. Content of parathyroid hormone has not been estimated | 84 | |

Thyroglobulin in blood serum was not estimated because of lack of reagents.

*1. Estimation of functional state of parathyroid glands through the level of ionize calcium in blood serum*

Estimation of ionized calcium was performed in blood serum of 755 cohort subjects. During the preliminary studies a value of regional norm was obtained (random sample of 150 healthy inds.) - 1,26±0,005 (Ì±σ2) ìMol/l, range of distribution: 1,1 - 1,35 mMol/l. These finding of regional norm were taken as a control index of ionized calcium content in blood while reviewing the results of examination of cohort subjects. While making an individual review of calcium in examined cohort (755 inds.) 1 subject (0.13%) had increased content of given index. Obtained data need to be further studied and need further examination of the cohort subjects. In particular, they should be subjected to examination of parathyroid hormone by radioimmunal method. Obtained data are entered to the "Paradox" DB for further reviewing.

*2. Estimation of thyroid functional state through the level of TSH in blood and iodine excretion with urine.*

TSH content have been estimated in blood serum of 434 cohort subjects. In 5 subjects (1.15%) decreased level of TSH in blood serum have been revealed, in 4 subjects (0,92%) increased level of TSH have been found.

**Milestone 10: Clinical Examination and Verification of Diagnosis in Patients with revealed pathology**

***(Quality Control Group)***

*Examination in Endocrinological Department, Clinic, CRIRME*

By 01.04.99 46 subjects have been referred to the Clinic of CRIRME (2 subjects were referred in previous quarter). Distribution of patients according to final diagnosis is presented in Table 5.

**Table5.**
**Distribution of patients according to the final diagnosis made in the Endocriniligical Department, CRIRME**

| IDC | Nosological form | Number of patients | |
|---|---|---|---|
| | | abs. | % |
| 193.0 | Thyroid cancer, State after surgery and (or) combined treatment | 11 | 28.9 |
| 241.0 | Nodular non-toxical goiter | 17 | 44.7 |
| 241.1 | Multi-nodular non-toxical goiter | 2 | 5.3 |
| 245.2 | Autoimmune thiroiditis | 5 | 13.2 |
| 999.92 | Operated thyroid | 3 | 7.9 |
| | Total | 38 | 100 |

As it is evident from presented data nodular non-toxical goiter dominates in the structure of pathology (44.7%). From the patients having this diagnosis three have been referred to the Center of Oncopathology for surgery: A.V. Belsky, V.P. Gerasimenok, L.V. Degtiarenko. At the clinical stage 15 thyroid FNBs have been performed. There were no differences in final clinical diagnosis and screening one.
0

**Milestone 11: Conduct the cytological and pathomorphological aspects of the Project.**

***(Screening Center)***

For the reported period cytologist examined bioptates obtained during the quarter in the Screening center (3 cases - 23 slides), cytological preparations of subjects punctered in the Clinic of Acsacovschina (24 cases - 83 slides), and in the Center of Oncopathology (5 cases - 13 slides). Distribution of subjects according to the obtained findings is presented in Table 6.

**Table 6**

**Distribution of subjects according to the results of thyroid FNB**

| **Result of FNB** | **Punctired subjects** | |
|---|---|---|
| | Abs. number | % |
| Non-informative | 9 | 28.2 |
| Changes have been not revealed | 16 | 50 |
| Cancer, suspicion to cancer | 4 | 12.5 |
| Follicular tumor | 1 | 3.1 |
| Atypic proliferation | 1 | 3.1 |
| Thyroiditis | 1 | 3.1 |
| **total** | **32** | **100** |

*(Pathology group)*

An expert review of hystological material have been performed for 13 subjects (3 of them were operated at the end of 1998 - beginning 1999, and 10 retrospective cases. Pathological summaries show the following: thyroid cancer - 8 cases, thyroid cancer on the backgroung of goiter with hyperplastic adenoma nodule - 1, adenoma goiter -1, goiter with hyperplastic nodule, - 2, oxiphil-cellular adenoma - 1.

**Milestone 13: Expert support of screening activities**

***(Quality Control Group)***

For the reported period QC Group performed quality control of disease coding at the clinical stage for the whole period of Project activity (1997-1998). It was revealed that IDC have been missed in 1,300 forms of screening and hospitalization stages. Manual coding has been performed according to IDC-9.

Review of clinical DB (1997-1998) showed that 220 preliminary summaries for 1997 have been missed. This gave grounds for complex check aimed at finding of missed screening forms for the whole period of examination. Results of given review is presented by DCC.

While comparing diagnoses of screening and hospitalization stages for all examined in 1997-1998 the following deviations have been revealed:

- on nosologic form (8)
- on number of thyroid nodules (5)
- on nodule location (5)
- difference between cytological and pathomorphologic summaries (2)
- difference between pathomorphologists of the Project and the Center of Thyroid oncopathology (see report for the 4-th quarter 1998)

Diagnoses are in the process of verification by the experts through the data of clinical documents and DB of ultrasound images.

It was also revealed that in 634 cases final screening diagnosis has been made without estimation of antibodies to blood serum because of lack of reagents. In cooperation

with DCC there was prepared a list of defected forms. This list was passed to Director of Screening Center for correction of diagnoses when necessary.

While reviewing grounds for making diagnoses it was found out that a whole number of subjects had increased levels of antibodies in blood serum on the background of absence of any clinical symptoms and changes from the side of thyroid echostructure.

DB of ultrasound images was also reviewed (225 slides for 31 patients). Some faults have been reviled (lack of name or ID of subject)

A list of subjects with nodular formations and punctured at hospitalization stage has been prepared and passed to the cytologist for retrospective expertise and completion of forms. Cytology findings are presented in the appropriate section of the report.

A list of subjects with thyroid cancer (23 ids.) having been operated previously was prepared for verification of pathomorphologic diagnosis. The results of pathology expertise are presented in appropriate section of the report.

**Milestone 13: Cooperation with mass media in order to inform population about Project activity and invite subjects to examination**

***(Epi group)***

In the framework of cooperation with mass media in order to inform population about the goals of the project and their attraction to examination there have been prepared articles to be published in local newspapers of Khojniki, Bragin and Kostucovichi rajons. These articles explained the principles of the study inviting subjects to screening examination.

## Task No. 5: Operational Manual and Project Forms.

**Milestone 14: Updating of the Operational Manual and study forms.**

***(Quality Control, Group, Unit Leaders )***

Changes to Operational Manual are presented in Appendix 1.

**Milestone 15: Development of instructions for filling in and data entry of epidemiological, screening, laboratory, and hospitalization forms.**

***(Quality Control, Group, Unit Leaders)***

During the course of the first quarter instructions have been completed how to fill in epidemiological, screening, laboratory, and hospitalization forms. The list of forms, instructions and corresponding appendices to Operational Manual is given in Table 7.

**Table 7.**

**List of instructions for forms completion and data entry.**

| 1 | Form | Instruction how to complete | Instruction for data entry | Annex in OM |
|---|---|---|---|---|
| | **APPENDIX A DATA COLLECTION FORMS AND SPECIFICATIONS** | | | |
| 1 | Initial Abstract Form | + | + | A-3-1 |
| 2 | Contact Form | + | + | A-3-2 |
| 3 | Initial Interview Form | + | + | A-5-1 |
| 4 | Annual Interview Form | + | + | |
| 5 | Mother's interview (at the period of breast feeding) | + | + | A-5-2 |
| 6 | Urine Collection, Processing and Results Form | + | + | A-5-3 |
| 7 | Blood Collection and Processing Form | + | + | A-5-4 |
| 8 | Ultrasound Examination Form | + | + | A-5-5 |
| 9 | Thyroid Palpation Form | + | + | A-5-6 |
| 10 | Medical Interview Form | + | + | A-5-7 |
| 11 | Needle Biopsy Form | + | + | A-5-8 |
| 12 | Adverse Event Report | + | - | A-5-9 |
| 13 | Blood Tests Results Form | + | + | A-6-1 |
| 14 | Summary Of Medical Screening and Recommendations | + | + | A-7-1 |
| 15 | Pathomorphological examination Form | - | - | A-8-1 |
| 16 | Hospitalization Abstract Form | + | + | A-8-2 |
| 17 | Death Data Form | + | + | A-8-3 |
| | **APPENDIX B MANAGEMENT FORMS AND REPORTS** | | | |
| 18 | Locator Form | + | + | B-5-2 |
| 20 | Control Form | + | + | B-5-4 |
| 21 | Transmittal Forms | - | - | B-5-5 |
| 22 | Nonresponse Form | - | - | B-9-1 |

**Milestone 16: Development of quality assurance manual**

***(Data Coordinating Center)***

In the first quarter DCC started working out Manual for Quality Control in the section of quality control of data. A part of this section is presented in Appendix 2.

**Task 6. Data management.**

**Milestone17: Design of part of data entry software for epidemiological, screening and hospitalization information.**

***(Data Coordination Center)***

For the reported period DCC performed the following activity:

- testing run of software for data entry of Medical Death Certificate has been completed;
- testing run of software for data entry of Pathomorphological Examination Form. Completion of test run was postponed because of lack of agreed Pathomorphologic Examination Form.
- testing run of software for data entry of Fine Needle Biopsy Form and Cytology Report. Completion of test run was postponed because of lack of agreed Fine Needle Biopsy Form and Cytology Report;

In the first quarter it was decided to change existing Summary of Medical Screening and Recommendations, and transform general Hospitalization Form into two different forms: Hospitalization Form (Clinic, CRIRME, Acsacovschina) and Hospitalization Form (Center of Thyroid Oncopathology). For this purpose

- it was developed a software for data entry of the new variant of Summary of Medical Screening and Recommendations.
- it was developed a software for data entry of the new variant of Hospitalization Form (Clinic, CRIRME, Acsacovschina)
- it was developed a software for data entry of the new variant of Hospitalization Form (Center of Thyroid Oncopathology)

**Milestone 18: Data entry of epidemiological, screening, laboratory, and hospitalization forms.**

***(Data Coordinating Center)***

The situation reflecting data entry of screening and hospitalization forms in the firs quarter is presented on Fig 1. Fig. 2 reflects the situation of laboratory forms entry for the first quarter. Fig. 3 shows the number of entered indices of laboratory tests. Number of entered indices of laboratory tests is different from the number of entered forms of results of laboratory blood tests because each such form contains 9 indices (TSH, Free T4, T4, ionized Ca, general Ca, albumin, Abs to TPO, Abs to TG, Tg) estimation of which is done in different periods of time depending on availability of diagnostical kits. The form is entered even in case when at least one index is estimated. Further entry of this or that data is performed in edit mode of previously entered form. From presented figures one could make a conclusion of satisfactory state of screening data entry and some delay in laboratory forms entry

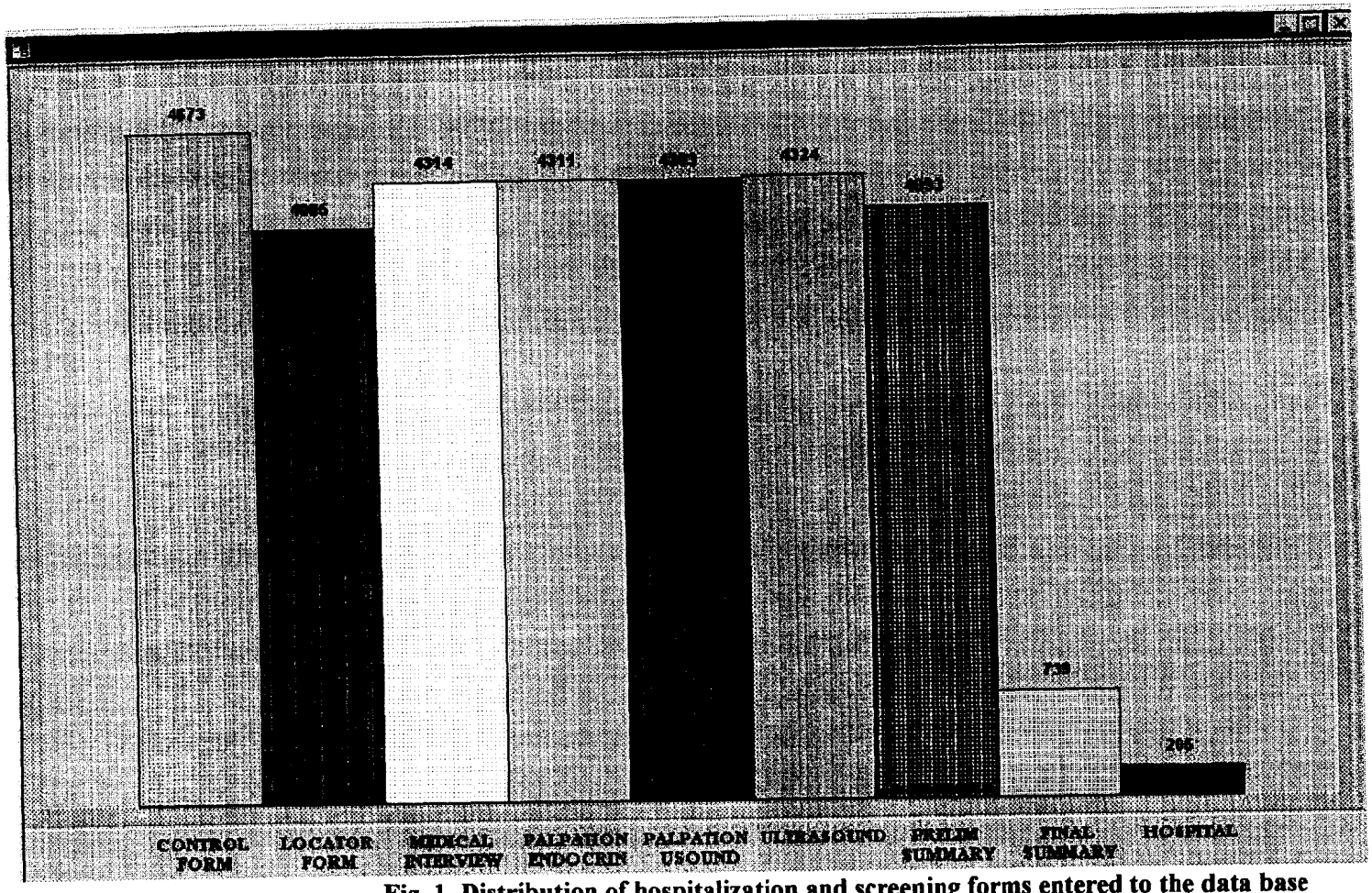



**Fig. 1. Distribution of hospitalization and screening forms entered to the data base**

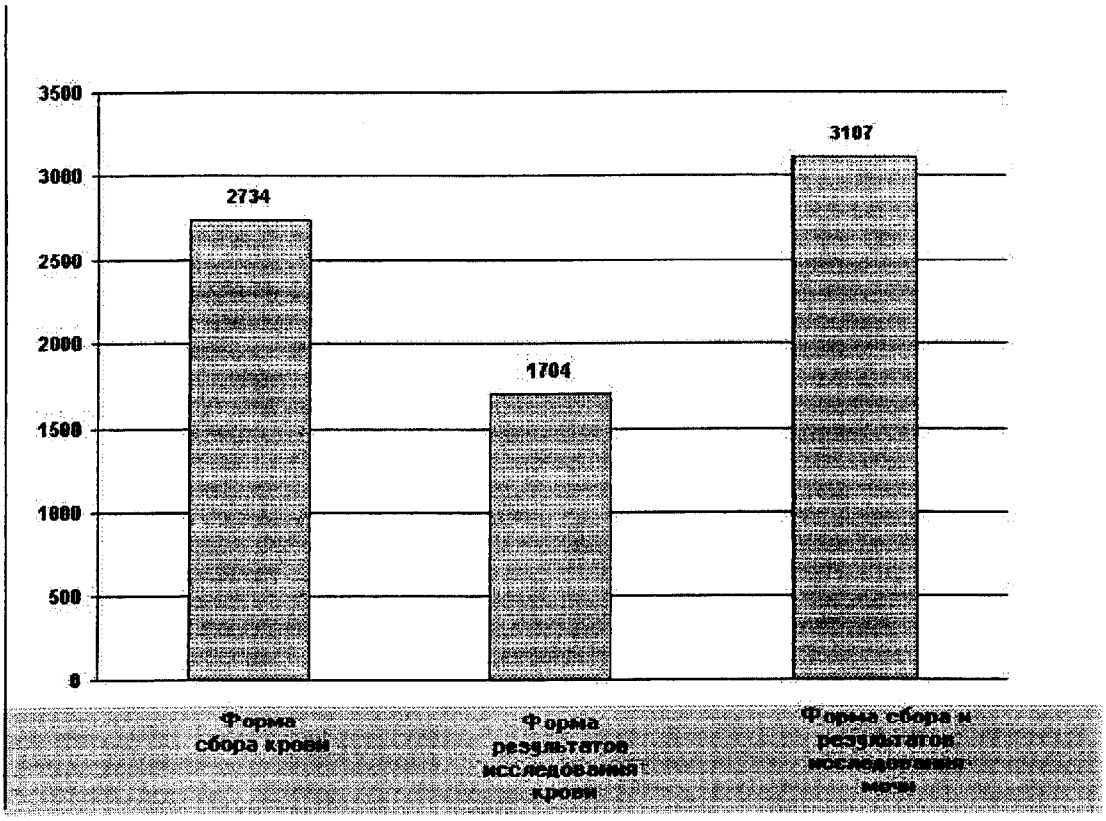



Fig. 2. Distribution of laboratory forms entered to the data base.

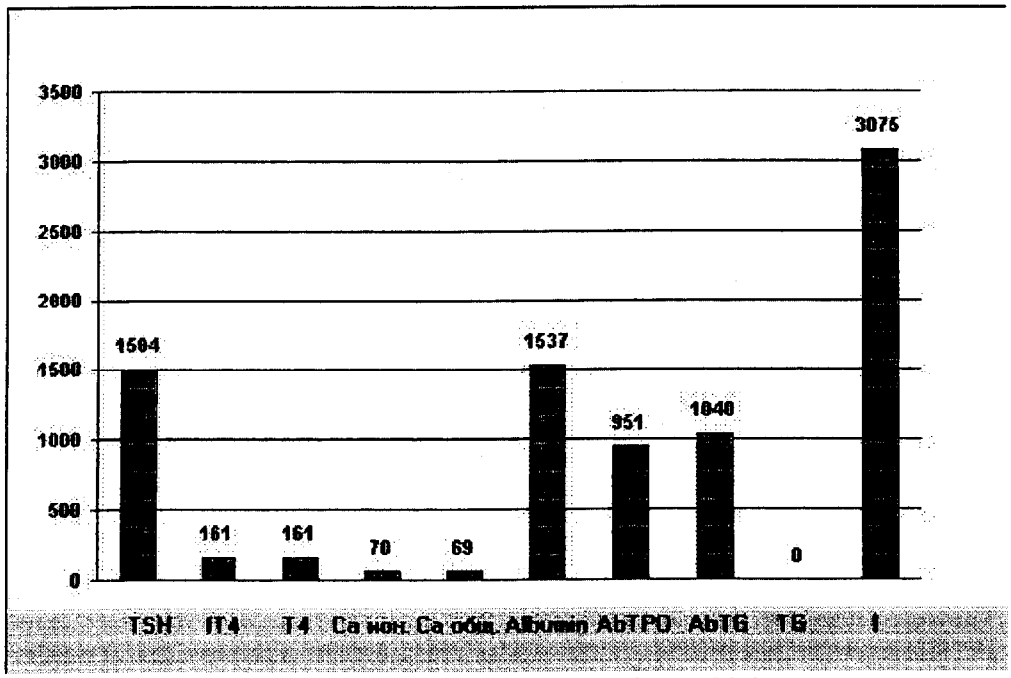



Fig. 3. Distribution of entered to the DB performed laboratory tests.

**Milestone 19: Transfer to the DCC file server of the data, entered in local computers of the screening center and central laboratory, and quality control of these data.**

***(Data Coordinating Center)***

For the reported period DCC staff transferred data from the Project Units to DCC server. Data came to DCC weekly through discs. While performing quality control of transferred data there were revealed mistakes in entering the date of the visit of different screening forms. It was revealed about 5% of mistakenly entered data. DCC made an effort to eliminate this problem. Mistakenly entered data have been additionally processed and corrected. To eliminate similar mistakes an algorithm have been worked out how to enter screening forms for given visit. This algorithm gives a possibility to enter manually date of visit only once while entering Locator Form. Entry of the rest screening forms related to the given visit is based on the date from Locator form which is selected automatically and does not need manual entry. This permits to minimize mistakes while entering the date of the visit.

**Milestone 20: Design of part of the query software for the epidemiological, screening and hospitalization information.**

***(Data Coordinating Center)***

- For the reported period DCC has completed software for estimation of efficiency of adresses search.
- In accordance with the requirements of epi group a report has been completed for creating a list of cohort subjects to be send to Medical Directors of Central Regional Hospitals to provide mobile team activity.

To perform quality control of collected information the following reports have been worked out:

- "Review of made diagnosis", which reflects screening diagnosis (text and IDC code) and results of laboratory tests of blood for cohort subjects that permits to estimate grounds for made diagnosis. Besides, using such report e4xperts could review whether diagnosis was coded correctly.
- Final screening summary without estimation of antibodies titre which permits to find diagnoses that do not follow the requirement of the study protocol,
- DCC has also worked out a report of screening examination parameters, hospitalization, pathology indices, number of made diagnoses, number of examined subjects for the period of time and according to sex.
- Personnel data base has been finished. Each project member has its personal ID number reflected in informational documents. For personnel who need to be certificated sign of certification is envisaged. This sign will be used for control of obtained data. Data obtained from non-certificated staff could be considered as data of insufficient quality. For the reported period a software has been completed allowing to estimate this or that characteristics of the cohort according to the place of residence. It is possible to see on the map of the country dynamic dynamic changes in cohort state e.g. according to epidemiological statuses. In addition to possibility of making analysis for Gomell and Mogilev oblasts we could make analysis for all oblasts of the country as well as according to dose rate

**Milestone 20: Analysis of the results and preparation some progress report on the cohort selection, scheduling of screening exams, subject flow through exams and data entry.**

***(Data Coordinating Center).***

Fig. 4 presents monthly distrubution of initially examined subjects for the whole period of Project activity. It should be noted that in the first quarter of 1999 554 subjects have been examinated for the first time (93 subjects more than previous quarter). Fig 5 shows monthly distribution of repeated examinations. In the first quarter main effort were aimed at engaging subjects to initial visit. Special invitations for repeated (annual) visit have not been sent. The number of repeated examination occurred from visits by indications of the physician (more than once a year), and those who had been invited earlier for repeated examination but did not come for any reasons .

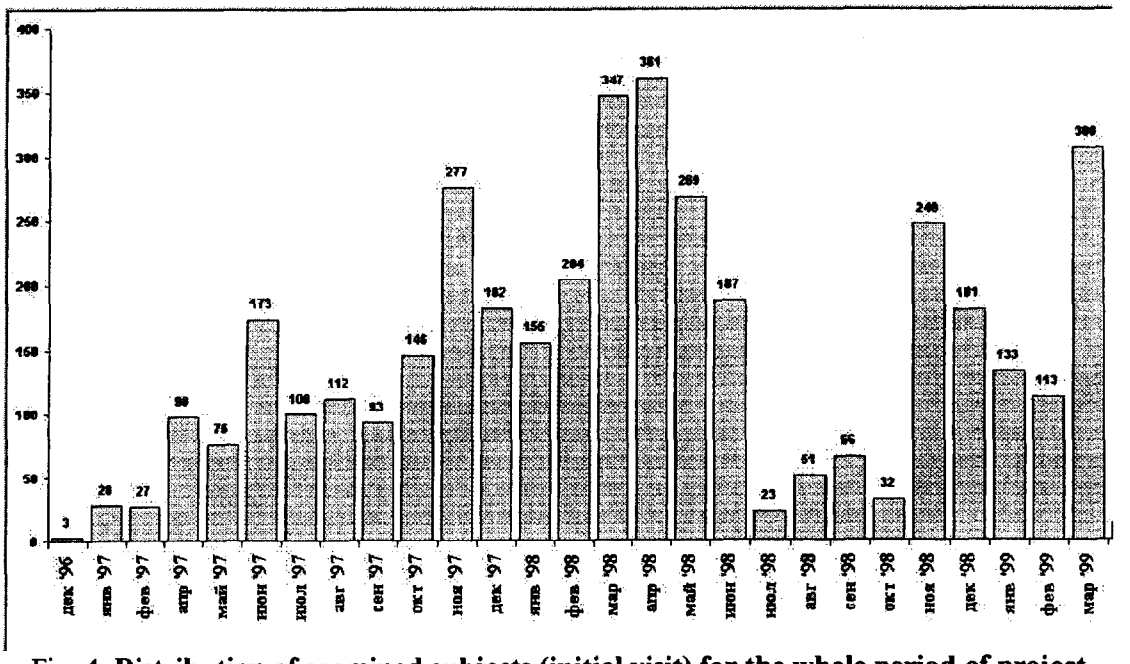



**Fig. 4. Distribution of examined subjects (initial visit) for the whole period of project activity.**

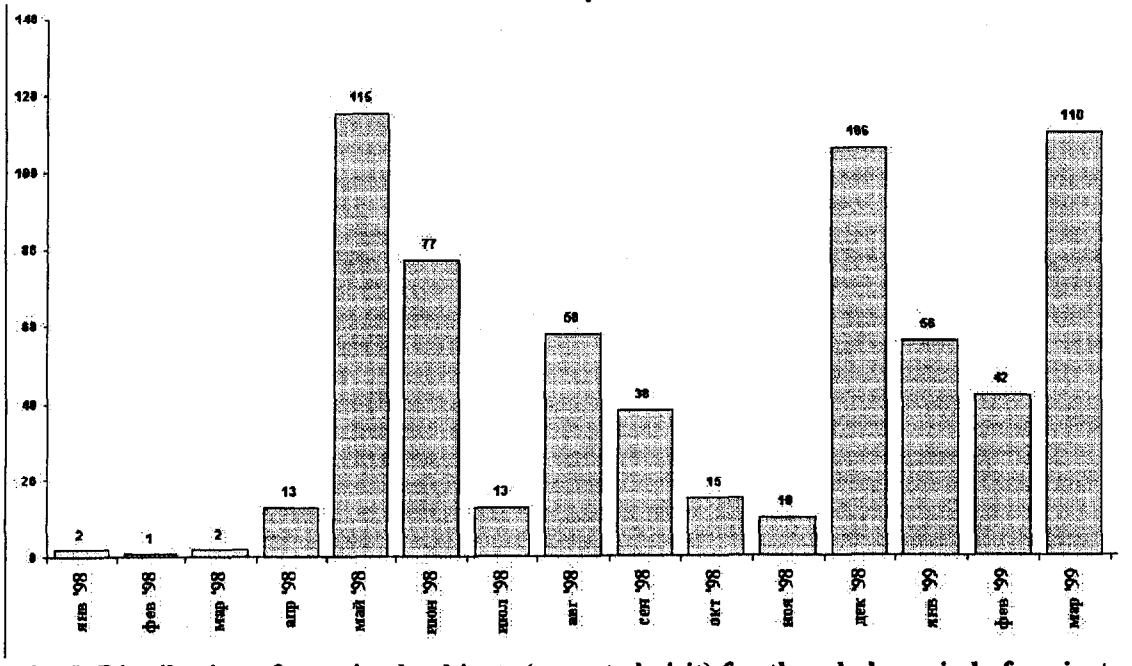



**Fig. 5. Distribution of examined subjects (repeated visit) for the whole period of project activity**

Fig 6 presents monthly distribution of refusals for the whole period of Project activity. Significant number of refusals in March 1999 could be explained by the fact that mobile team operated that period in Bragin and Khojniki (1033 inds. have been invited to examination). In course of mobile team activity in these rajons epidemiologists had an opportunity of personal contact with provisional cohort subjects and received realized refusals from participation in the Project. At the same time when correspondence contact (through letters) subjects refused from participation in examination do not respond to invitation and are included to the group "no response within a month". In course of further examination it will be reasonable to apply to refused subjects in some periods of time to get them involved to the study.

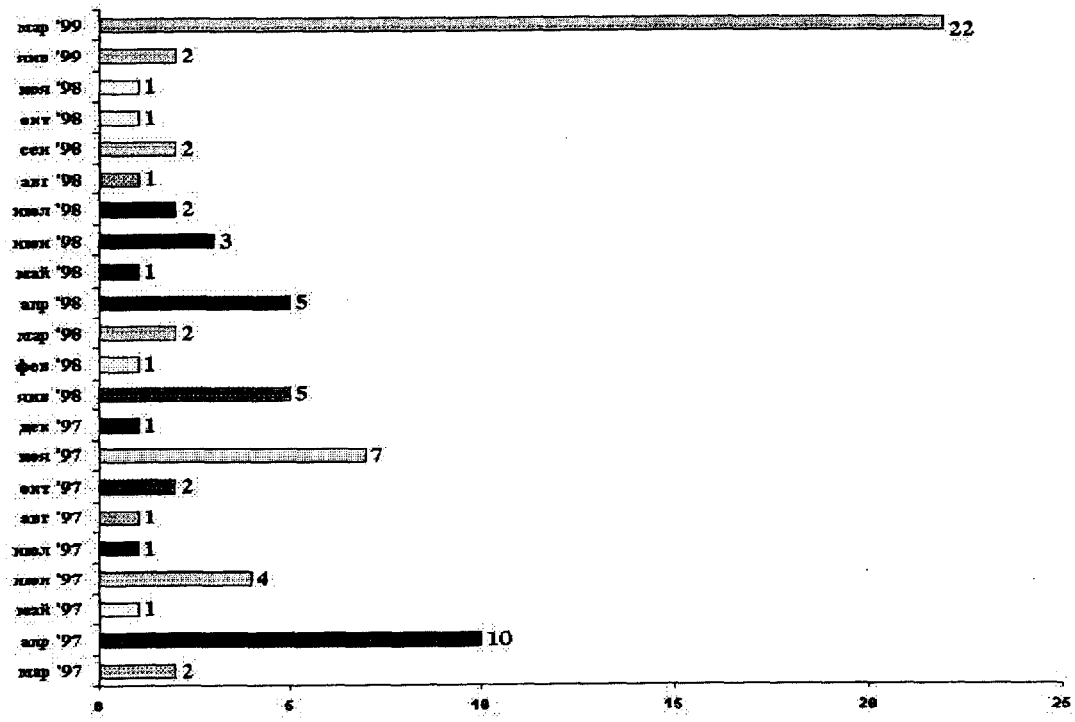



**Fig . 6. Distribution of refusals from participation in the Project**

One of the principle tasks of cohort establishment is identification and examination of cohort subjects from high dose group. It is evident that the majority of high dose subjects is concentrated in Gomel oblast. By the end of the first quarter it was examined

| Oblast | Number of examined high dose subjects |
|---|---|
| Gomel | 1417 |
| Mogilev | 28 |
| Vitebsk | 17 |
| Grodno | 42 |
| Minsk and Minsk city | 336 |
| Brest | 26 |
| Total | 1866 |

1866 subjects or 22% from the total number of high dose subjects

Fig. 7 presents distribution of examined high dose subjects by the rajons on the map of Gomel oblast.

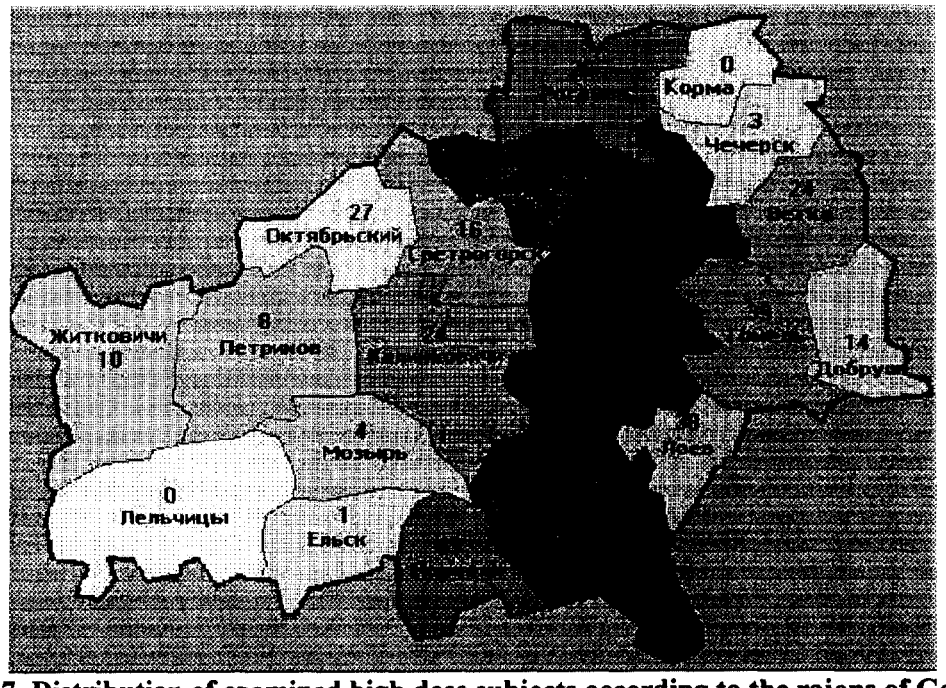



**Fig. 7. Distribution of examined high dose subjects according to the rajons of Gomel oblast**

Fig. 8 presents the distribution by rajons of Gomel oblast of subjects having status "no response within a month". It is evident that there is a sourse of high dose subject for mobile team activity in Khojniki, Bragin, Rechitsa, Narovlia, Love, Buda-Koshelevo rajons.

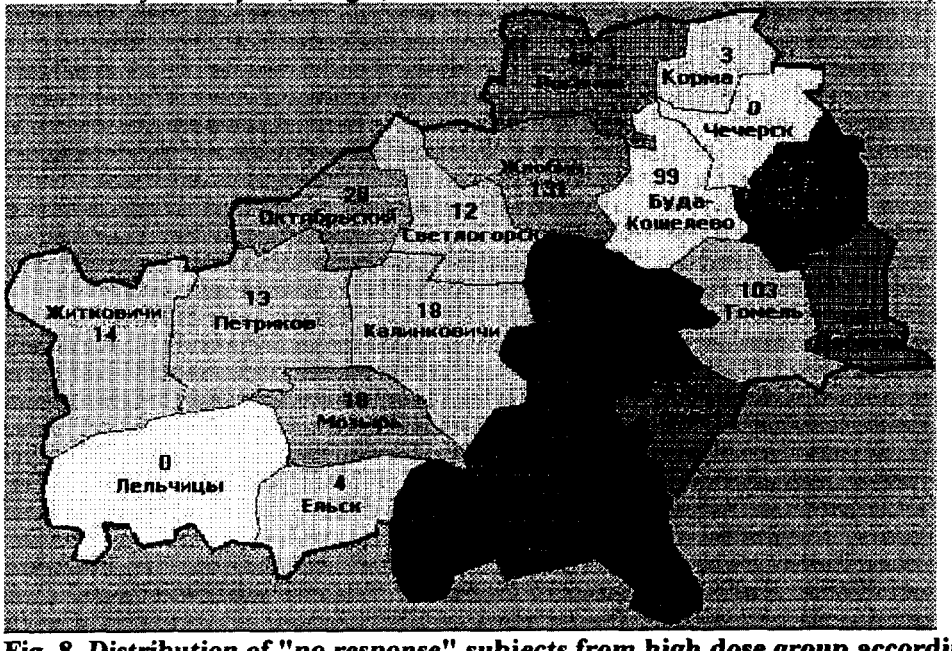



**Fig. 8. Distribution of "no response" subjects from high dose group according to the rajons of Gomel oblast**

*(Epi Group)*

The results of the review of cohort current state is presented in Table 8

**Table 8**

**Distribution of statuses among invited to initial visit in the 4-th quarter**

| Status | Number of Subjects | | | |
|---|---|---|---|---|
| | January | February | March | total |
| No response within a month | 181 | 244 | 861 | 1286 |
| does not reside given address | 43 | 31 | 113 | 187 |
| Preliminary consent to be examined in Minsk | 4 | 17 | 94 | 115 |
| Preliminary consent to be examined by mobile team | 126 | 102 | 226 | 454 |
| Come to examination | 165 | 91 | 278 | 534 |
| Refuse | 2 | 0 | 22 | 24 |
| Death | 0 | 1 | 4 | 5 |
| Moved out of Belarus | 1 | 0 | 6 | 7 |
| Reserve | 37 | 13 | 74 | 124 |
| Does not fit by age | 1 | 1 | 0 | 2 |
| Double in the DB | 2 | 1 | 16 | 19 |
| Imprisoned | 4 | 0 | 6 | 10 |

Table 8 presents the statuses of cohort subjects to whom letters were sent in the period of 01.01.99 - 31.03.99.

As a result 534 subjects have been examined (by Minsk Dispensary and by Mobile team). The rest 20 subjects examined in the first quarter have been invited before the first quarter 1999.

Percentage of received consents at average for the quarter was 29%, percentage of examined in comparison to invited was 23.9% (Fig 9

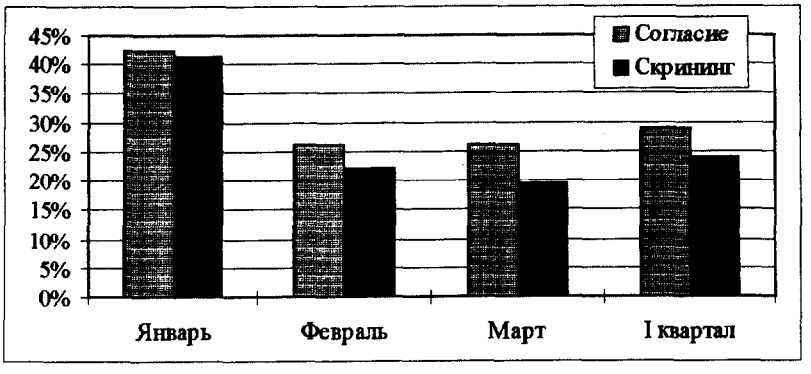



**Fig. 9. Dynamics of indices of number of patients who given consent to initial examination and undergone screening from the total number of invited**

Percentage of examined to given consents at average for the quarter was 82.3%, varying from 74,4% in March to 97.6% in January (Fig. 10). Generally, received data correspond to similar data for the fourth quarter of 1998.

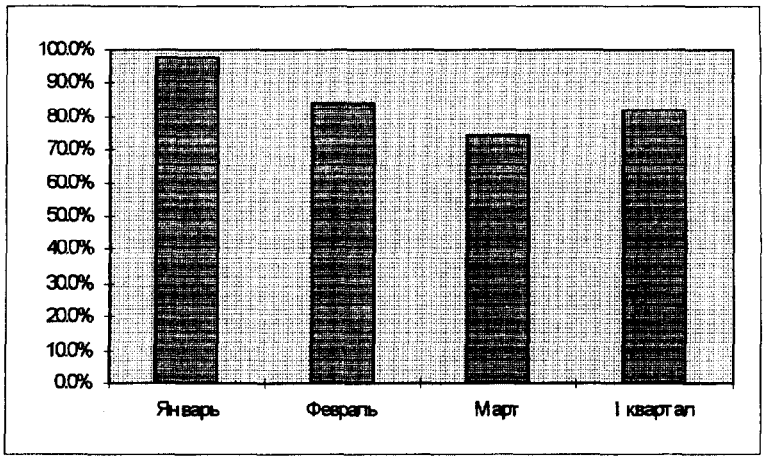



**Fig. 10. Dynamics of number of examined subjects from those given consent**

The principal question of continuation of cohort establishment is the possibility to identify subjects of high dose group. For this purpose a review of efficiency of high dose subjects search was made for the whol period of Project activity (21.12.96 - 15.04.99). The results are presented in Table 9.

**Table 9.**

**Results of subjects search for the period of 21.12.96-15.04.99, %**

| PLACE OF SEARCH | NEW ADDRESS IS FOUND | ADDRESS IS NOT FOUND |
|---|---|---|
| Belarus | 69,5 | 30,5 |

83,6% of addresses from all identified have been found in Gomel oblast, 10,3% - in Minsk oblast, 2,3% - in Mogilev oblast, 1,3% - in Grodno oblast, 1,2 – in Vitebsk oblast, and 1,1% - in Brest oblast.

While making contacts with cohort subjects with identified addresses the following results have been obtained (Table 10)

**Table 10**

**Results of contacts with cohort subjects with identified addresse, %**

| REGION | RESPONSE | NO RESPONSE | WRONG NEW ADDRESS |
|---|---|---|---|
| BELARUS | 43,6 | 45,4 | 11 |

Efficiency of subjects identification is still high. At present more important question is getting a subject for screening examination rather than its identification. Repeated invitations, personal telephone talks, visits to subjects places allows to involve more subjects not responded to invitation.At the same time there is high percentage of subjects living new identified address not refusing from examination while talking to epidemiologist but do not come to screening. To involve such subjects some additional measures should be used aside with written and oral invitations of epidemiologists.

Experience of address identification shows that subjects having status "wrong address" (table 10) will appear at all stages of search. Such phenomenon is happened because those who live in southern rajons of the country move to a new place of residence as soon as they have got such opportunity. For the time passed from the moment of getting by the epidemiologist a

new address registered in the address office of Gomel oblast to the moment of receiving a letter by the subject, the last one could move to another place of residence. Searching process in such case will be continued through address offices of other oblasts. Review of the results of searching activity through oblasts of the republic allowed to make a conclusion of necessity to perform general search of all the subjects having statuses of "not found" and "wrong address" through all address offices of the country. This activity will be performed in the second quarter.

**Milestone 27: Design of image processing procedures, and data base of thyroid images.**

In the course of further development of procedures for thyroid images processing and creation of thyroid images DB a question has been discussed regarding storage of thyroid images DB on CDs. As far as storage of complete DB of thyroid images great volumes of hard disk storage of images on CDs is more convenient and flexible method. (Fig. 11). As a result of the discussion it was suggested to store only the latest actual information of 640 MB. As soon as recorded information will exceed this volume – record images to CD which actually will serve as archive of thyroid images. To simplify the search of necessary image an additional field is introduced to the DB. On the other hand it was suggested to create labels to CDs. It was also discussed a question of usage of MOD registration log while creating Data Base of Thyroid Images (DBTI). It was found out that information from general patients DB is enough. Registration log could be used for QC procedures of data entry (patient's ID, # of image) because the same data are entered to different tables that could be easily compared. And as a result an error of entry could be found. To provide access to the images of defined patient it was developed a function of thyroid image search via ID of a patient. Given function makes it possible to look through all images for the patient and track the dynamics of changes in the thyroid. It was started a development of method for search of thyroid image by fixed date to have an opportunity to review ultrasound data and thyroid images for a given visit. As far as LView Pro 20 program used for convertation of TIFF files to JPG is a demonstrating program (20 day of trial version) it was decided to create a necessary utility based on available libraries of Visual Basic or C++. A special search was performed in the Internet with respect to find libraries transforming files of thyroid images from TIFF format to JPG.

Errors found in the course of testing run of previous program have been corrected.

- Wrong record of file name: in the directory with defined ID file with wrong date was recorded. After correction of function responsible for date conversion date in file name corresponds to the date of the visit.
- Wrong approach when determining # of examination in the file of CRI format: previously # of examination was read out from fixed symbolical position in the file of thyroid images. As it turned out number of this position could be changed. As a result, more flexible search of examination # was implemented in graphic file of thyroid image. It was started testing creation of thyroid images DB on server and its storage on DAT tapes. It was also found out that because of mistakes during data entry of ultrasound information from the side of operator while creating DBTI it is necessary to look through obtained structure of catalogues and transfer manually image files to catalogues with ID corresponding to the given file

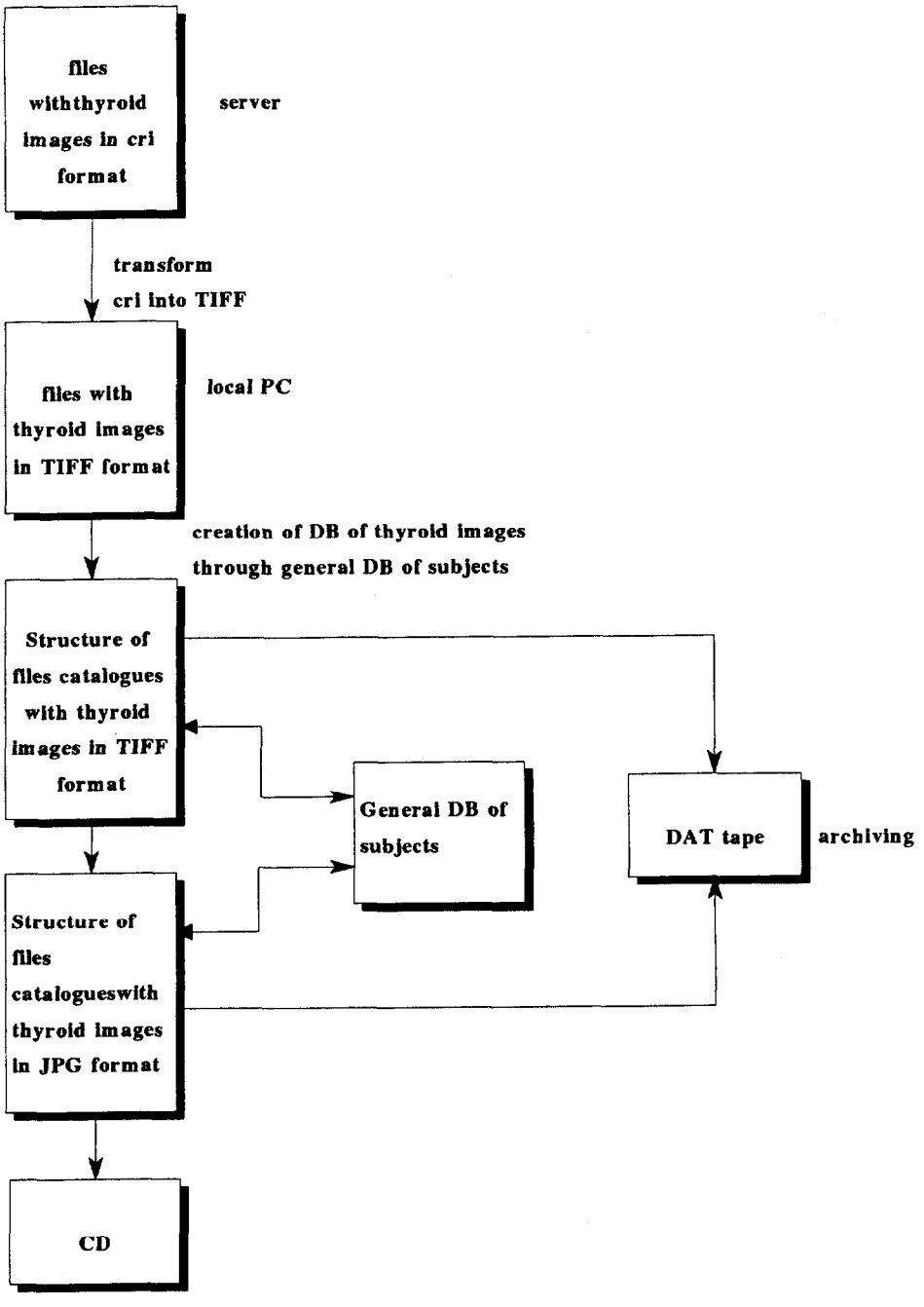



**Fig 11 Chart for creation and usage of thyroid images DB**

## Task No.7 The Estimation of Individual Thyroid Doses for Members of the Cohort

**Milestone 22: Conduct personal interviews for all subjects screened in the Project.**

*(Dosimetry Group)*

For the reported period (January 1 - March 31) 182 individuals were interviewed through individual dosimetric questioner (66 inds. - initial, 112 - repeated, 4 - have not been interviewed)).

Review shows that the subjects come for examination

| | initially | repeatedly |
|---|---|---|
| • on one's own | 46 | 58 |
| • together with mother | 13 | 43 |
| • together with father | 2 | 2 |
| • together with sister or brother | 5 | 7 |
| • with other accompanying | - | 2 |

In the first quarter 6 questioners were completed for mothers in the period of breast feeding. 61 subjects came to interview without self-interview (12 come without invitation). Distribution of the cohort subjects is presented in Fig. 11

Results of interviews with respect to the completeness of the subjects' answers is presented in Table 11.

**Table 11.** Results of interviews with respect to the completeness of the subjects' answers.

| Estimation of interview qual. | Initial interview | Subsequent interview |
|---|---|---|
| good | 30 | 55 |
| satisfactory | 24 | 45 |
| unsatisfactory | 12 | 12 |

Additional data collection through individual interviews was performed by the interviewer joined to the mobile team in the towns of Khoiniki,Bragin, Kostukovichi. In Bragin the examination was performed twice from 25 January – 5 April

Total number of cohort subjects come to examination was 328. 326 of them were interviewed (two subjects refused from interview). 291 subjects were initially interviewed, and 35 - repeatedly). 258 subjects come to interview without self-interview forms

Subjects come for examination

| | Initial visit | Subsequent visit |
|---|---|---|
| • on one's own | 238 | 26 |
| • together with mother | 32 | 8 |
| • together with father | - | - |
| • together with sister or brother | 18 | 1 |
| • with other accompanying | 3 | - |

Table 12 presents distribution of 326 subjects responses with respect to the quality of obtained data.

**Table 12.**

Results of interviews with respect to the completeness of the subjects' answers.

| Estimation of interview quality | Initial | Subsequent |
|---|---|---|
| good | 94 | 12 |
| satisfactory | 64 | 15 |
| unsatisfactory | 133 | 8 |

In the period of February 9 -February 13, 1999 additional data collection through individual interviews was performed by the interviewer joined to the mobile team in the town of Kostukovichi

Total number of cohort subjects come to examination was 31. 30 of them were interviewed for thr first time and 1 - repeatedly. @5 subjects came without self-interview forms

Subjects come for examination

| | Initial visit | Subsequent visit |
|---|---|---|
| • on one's own | 16 | 1 |
| • together with mother | 9 | - |
| • together with father | - | - |
| • together with sister or brother | 4 | - |
| • with other accompanying | 1 | - |

Distribution of 31 subjects' answers with respect to the quality of obtained data is shown in Table 13

**Table 13** Results of interviews with respect to the completeness of the subjects' answers.

| Estimation of interview qual. | Initial interview | subsequent interview |
|---|---|---|
| good | 15 | - |
| satisfactory | 6 | 1 |
| unsatisfactory | 9 | - |
| | | |

In the period of March 21-March 26,199 additional data collection through individual interviews was performed by the interviewer joined to the mobile team in the town of Khoiniki. Total number of cohort subjects come to examination was 224. 173 of them were interviewed for the first time and 34 - repeatedly (4 subjects refused from interview). 97 subjects came to examination without self-interview forms.

Subjects come for examination

| | Initial visit | Subsequent visit |
|---|---|---|
| • on one's own | 161 | 34 |
| • together with mother | 17 | 4 |
| • together with father | 1 | - |
| • together with sister or brother | 1 | - |
| • with other accompanying | 2 | - |

Distribution of 220 subjects' answers with respect to the quality of obtained data is shown in Table 14

**Table 14.** Results of interviews with respect to the completeness of the subjects' answers.

| Estimation of interview qual. | Initial interview | subsequent interview |
|---|---|---|
| good | 53 | 9 |
| satisfactory | 58 | 12 |
| unsatisfactory | 71 | 17 |

During the field trip to Khojniki dosimetrists had a talk to Chief Nurse of the Central Regional Hospital who in 1986 was involved in evacuation activity and iodine prophilaxis. As it was revealed evacuation in Khojniki began om May 7,1986 and was continued for 1-2 days. During May 1-3, 1986 KI pills were distributed to the population.

**Table 15.** Total results interviews with respect to the completeness of the subjects' answers.

| Estimation of interview qual. | Initial interview | repeated interview | total |
|---|---|---|---|
| good | 192 | 76 | 268 |
| satisfactory | 152 | 73 | 225 |
| unsatisfactory | 225 | 37 | 262 |
| TOTAL | 569 | 186 | 755 |

Fig 12 presents the distribution of cohort subjects with respect to the age at the moment of the accident.

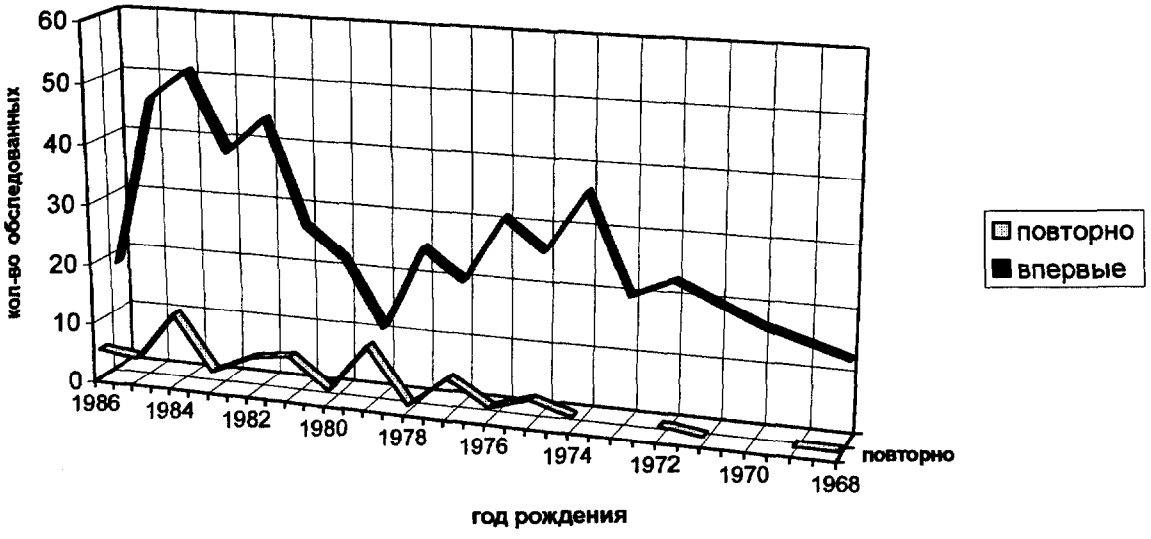



**Fig. 12. Distribution of subjects having neen interviewed in the first quarter of 1999 according to their age at the time of the accident**

**Milestone 24: Enter to the data base information from interviews collected in the course of the quarter as well as data from 1000 interviews that have been performed earlier; prepare the section of the Dosimetric Operations Manual related to data entry.**

Data entry of subjects' individual interview was continued in the first quarter only for initially interviewed.
For the current quarter all initial interview data of the current quarter(311 forms) have been entered and all interview forms of 1997.

Total number of interview forms entered to the DB for the first quarter and for the whole period of Project activity is presented in Table 16.

**Table16.**

| First quarter | Total for the whole period |
|---|---|
| 875 | 3474 |

**Milestone 25: Prepare the section of the Dosimetry Operations Manual related to repeat interview. Develop procedure for verification of interview data**

*(Dosimetry Group)*

Subsequent interview

To perform subsequent interview a form have been developed "Subsequent individual interview" which differs from "Individual interview " by the number of questions (less), the content of questions is the same. The aim of subsequent interview is clarify and extend the information obtained in the course of previous interview. It is envisaged that subsequent interviews should be performed till full answers to all suggested questions will be obtained. That is why when performing subsequent interview interviewer should possess the information from previous interview. At present this information is available in paper forms. It is planed that in future interviewer will have an access to the whole necessary information in computer DB. If so, interviewer when subsequent interview will ask only questions left without response or "do not remember" or incomplete response. If by the time of subsequent interview the interviewer does not have the data of initial interview, he will ask all questions of "Subsequent interview". Appendix 3.1 presents the form of "Subsequent Individual Interview"

Instruction for completion of form "Subsequent Individual Interview" is given in Appendix 3.2. Given instruction is similar to that of initial interview. The data of subsequent individual interview is stored in the Dosimetry Laboratory

Data Entry of Subsequent Interview

Data entry from paper forms of Subsequent individual Interview to computer DB is performed by operator. DB is implemented in DBMS Microsoft Access. Instructions for data entry is presented in Appendix 3.3.

DEVELOPMENT OF PROCEDURE FOR DATA VERYFICATION

To perform the procedure for veryfication of initial interview data 100 forms have been selected at random of each of threee intrerviewers. While reviewing the forms an attention was paid to the following:

1. If the interviewer realises correctly what information is necessary to obtain for each question;

2. If the form of putting answers corresponds to the suggested in the instructions;
3. If interviewer take into consideration

a) time period in the question and

б) place, i.e. if the question referres to the place of residence (at the time of the accident) or to the place where subject moved.

In the questions like milk cosumption in April-May 1986 special attention was paid to the following wether the information put to the fields "settlement" and "terms of consumption" corresponds to field "moves in 1986", question 11.

Old (not updated) interview forms have been also reviewed the following way. A box was taken with interview forms completed by one interviewer for definite period of time . And approximately each fifth form was reviewed (interviewers stores completed forms in boxes according to the time of interviewing).It should be mentioned that up till now there is no adequately arranged archive for forms storage. It complecates the quality control of completed forms. The following period of time was covered by performed control: January, February, March, April, May, August,September, October, November 1998.

All found faults could be devided in two groups

1) slips of the pen, slight deviations from from suggested form of putting answers. Such faults complicates the the work of operator while transfering data from paper to computer but do not effect to dose estimation. Examples of faults

Sex is not marked with "×"

The floor where the subject lived at the moment of the accident is not mentioned. (though it is evident that it was not the ground floor)

The answer to the question of milk consumption (green vegetables) is not marked with "×", but the table of milk (vegetables) consumption is completed

The answer to the question of X-ray films is put in a wrong way

In the field "organ of the body" all interviewers put names of organs but not codes.

.....2) The second group of the faults are those effecting to dose estimation. It should be mentioned that such faults were met rarely. Mostly it was dealing with table of milk consumption in the period of 26.04 to 31.05 1986 and information of iodine prophilaxis. All the faults should be corrected.

Following performed quality control appropriate recommendations have been given to each interviewer.

**Milestone 26: Dose calculation. Prepare the section of the Dosimetry Operations Manual related to description of dose calculation procedure. Verify how algorithm works properly by means of manual calculations for 5 subjects.**

1 Algorythm for thyroid dose calculation..

1.1. Used software.

1.2. Initial data.

1.3. Used mathematic formulas.

1.4. Estimation of starting date of $^{131}I$ intake to the body.

1.5. Estimation of date of milk consumption ceasing

1.6. Estimation of starting date of iodine prophylaxis

1.7. Estimation of date of of iodine prophylaxis ceasing

1.8. Estimation of date of thyroid exposure dose measurement

1.9. Estimation of date of leaving contaminated territory for clean one

2. Review of errors while using dose calculation software

3.Calculation of inndividual thyroid doses.

4. Veryfication of algorythm through manual calculations for 5 subjects

1.1. Using software.

Development of applied software for individual thyroid dose calculation based on the data of individual interviews is grounded on the capacities provided by Data Base Management Systems (DBMS) Microsoft Access and Visual Basic for Application (VBA) language. Initial implementation of tables for storage of individual iinterview data and forms of data entry was performed in Access 2.0 format in the second quarter 1998. Recently all the tables and forms of data entry are tranformed to Access 8.0 format. Program of individual thyroid dose calculation was implemented by means of VBA 8.0 in the form program module built in to the file of data base. Such approach limitates the work of dose calculation program by the capacities of DBMS Access but it is enough for dose estimation.

1.2. Initial data.

Initial data for the program of individual thyroid dose calculation in accordance with the data of direct measurements are formed from two sources: 1 - table of data base of direct measurements provided by the Institute of Biophysics: 2 - table of data base of individual interview results (below is also called as dosimetry data base). Table of data base of direct measurements and "Patients" table of interview data are connected by key field of ID through relation of "one to oone type"
While calculating individual doses from the table of data base of direct measurement the values are taken from the following four fields:

1. "MEAS_DATE" – date of measurements of thyroid exposure dose rate
2. "MEAS_RATE" – measured thyroid exposure dose rate
3. "RATE" - related to thyroid exposure dose rate
4. "DOSE" – dose mentioned in the data base of direct measurements

In calculative formulas the values of three fields are used. While selecting values of thyroid exposure dose rate the first is the value from the RATE field. The values from MEAS_RATE field are used only when the the value of RATE field contains the value of NULL type, i.e. is empty. The fourth field is used for comparison of calculated doses with those provided by the Institute of Biophysics.
THE MAIN BULK OF DATA USED FOR DOSE CALCULATION IS TAKEN FROM THE TABLES OF DOSIMETRY DATA BASE. USED TABLES AND FIELDS ARE GIVEN BELOW IN DESCRIPTION OF ALGORYTHM FOR THYROID DOSE CALCULATION.

1.3. Used mathematic formulas.

In general thyroid exposure dose from $^{131}I$ based on thyroid direct measurements is estimated by the following expression

$$D(T) = \frac{E}{m(T)} \cdot Q \qquad (1)$$

when $D(T)$ - thyroid exposure dose, depended from age, Gy ;
$E$ - effective energy of decay $^{131}I$, $3.68 \cdot 10^{-14}$, J decay$^{1}$ [1];
$m(T)$ - thyroid weight depended from age, kg, age depended values of $m(T)$ are presented in the table 26.1;
$T$ – age of the cohort subject by 26.04.1986, complete years;
$Q$ - time integrated $^{131}I$ content in thyroid, Bq sec.

While estimating time integrated $^{131}I$ content in thyroid according to the ref. [2, 3] formula (1) becomes the following:

$$D(T) = K_{day} \cdot \frac{E}{m(T)} \cdot G(T) \cdot F(T) \qquad (2)$$

when $K_{day}$ =86400, number of seconds per day, sec day$^{-1}$;

$G(T)$ – calculated $^{131}$I activity in thyroid, Bq;

$F(T)$ – function describing kynetics of $^{131}$I penetration to thyroid, day.

$^{131}$I activity in thyroid at the moment of measurement is calculated by the following formula:

$$G(T) = CF(T) \cdot (P_{th} - P_b) \qquad (3)$$

when $CF(T)$ – calculative factor from thyroid exposure dose rate measured by SRP-68-01 to $^{131}$I activity in thyroid, Bq mcR h$^{-1}$ time depended values of CF are presented inntable 26.1

$P_{th}$ - readingds of SRP-68-01 over thyroid, мсR h$^{-1}$;

$P_b$ - "background" readings of SRP-68-01, мсR h$^{-1}$.

Age depended values of thyroid parameters (weight, effective loss constant and calibration factor) are devided into 18 age group and presented in table 17

**Table.17.** Age depended values of parameters used for the program of individual thyroid dose calculation.

| Age, years | Calibration factor for SRP-68-01 for $^{131}$I, BBq мсR h$^{-1}$ | thyroid weight | Effective loss constant of $^{131}$I from thyroid, day$^{-1}$ |
|---|---|---|---|
| | CF | $m$ | $\lambda_{th}$ |
| 0-1 | 99.5 | 1.3 | 0.127 |
| 1-2 | 101.8 | 1.8 | 0.120 |
| 2-3 | 103.4 | 2.3 | 0.117 |
| 3-4 | 104.8 | 2.7 | 0.114 |
| 4-5 | 106.6 | 3.2 | 0.111 |
| 5-6 | 109.5 | 3.9 | 0.108 |
| 6-7 | 111.3 | 4.8 | 0.106 |
| 7-8 | 117.8 | 5.7 | 0.103 |
| 8-9 | 122.3 | 6.6 | 0.101 |
| 9-10 | 126.5 | 7.5 | 0.098 |
| 10-11 | 129.9 | 8.4 | 0.096 |
| 11-12 | 132.4 | 9.3 | 0.096 |
| 12-13 | 134.5 | 10.2 | 0.096 |
| 13-14 | 136.4 | 11.1 | 0.096 |
| 14-15 | 138.7 | 12.0 | 0.095 |
| 15-16 | 141.7 | 13.2 | 0.095 |
| 16-17 | 145.5 | 14.7 | 0.095 |
| 17-18 | 150.0 | 16.2 | 0.094 |

$F(T)$, function used for calculation of individual dose of cohort subject is implemented for 12 variants of $^{131}$I intake to thyroid presented in appendix 26.1. Below $F(T)$ function is expressed as «kynetic» function.

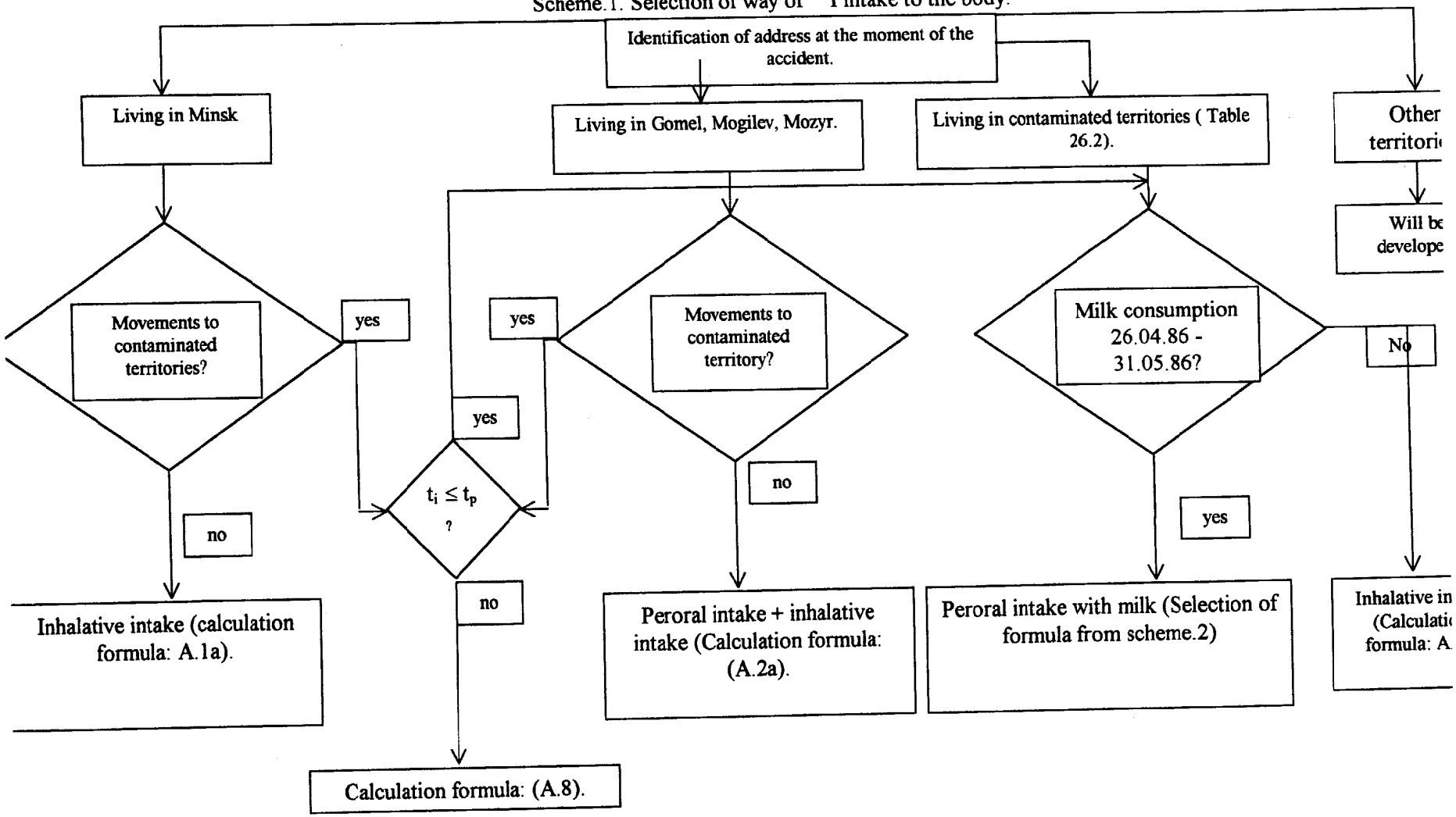
Selection of exact variant of kynetic function for individual dose calculation is determined by the data of individual interview in accordance with schemes 1 and 2 and require the following 6 dates:

- starting date of radioiodine intake
- date of milk consumption ceasing
- starting date of iodine prophylaxis;
- date of iodine prophylaxis ceasing
- date of thyroid exposure dose rate measurement
- starting date of cattle pasturing

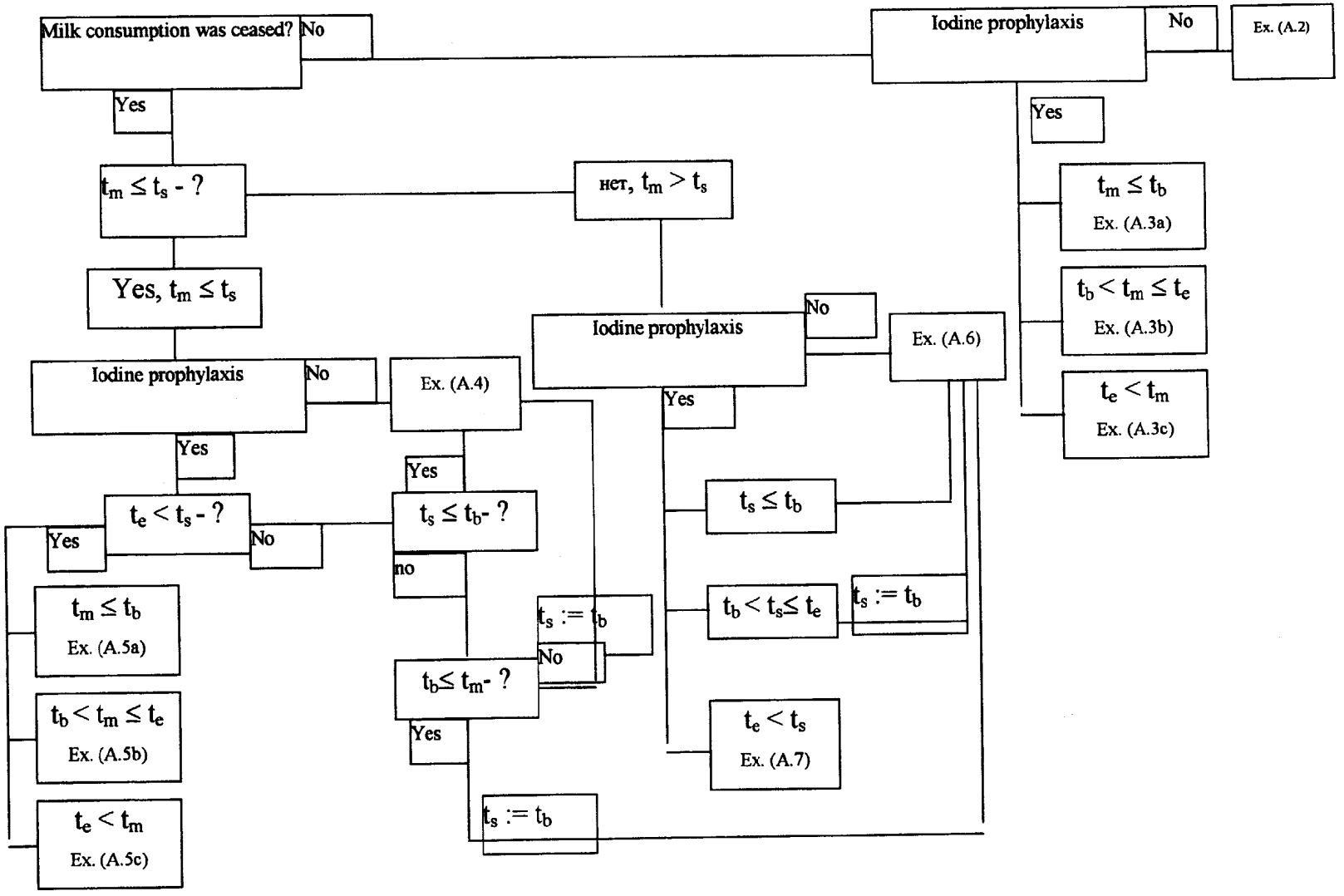
These dates are used for calculation of time intervals between the starting date of radioiodine fallout on the territory of subject living at the time of the accident and the other dates. Time inervals are expressed in days. Following estimation of time intervals selection of radioiodine intake and individual thyroid dose calculation are performed.

General scheme of program for individual thyroid dose calculation is presented in Scheme.3.

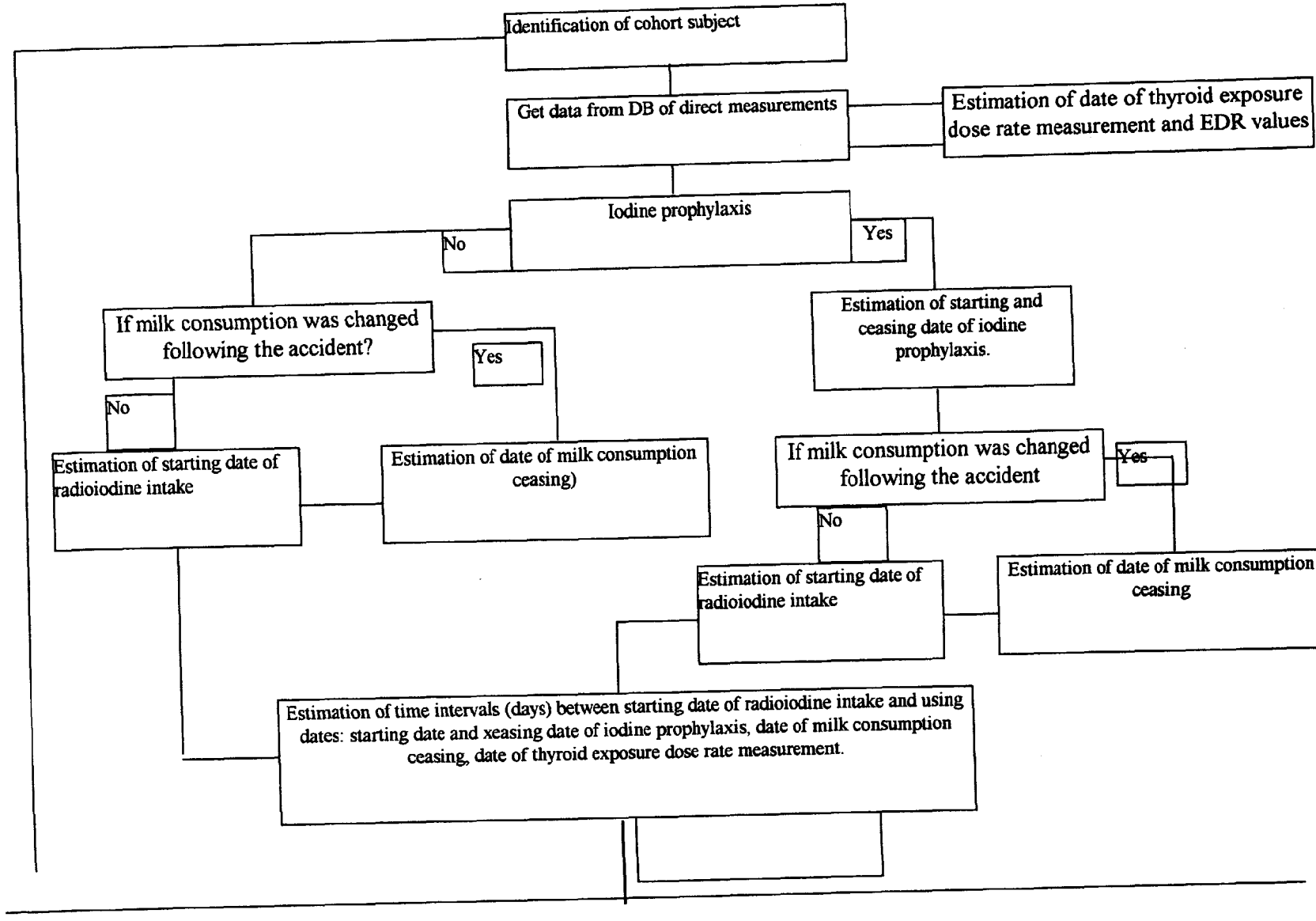
Scheme.1. Selection of way of $^{131}I$ intake to the body.



Scheme 26.2. Selection of calculation formula when per-oral $^{131}I$ intake with milk.

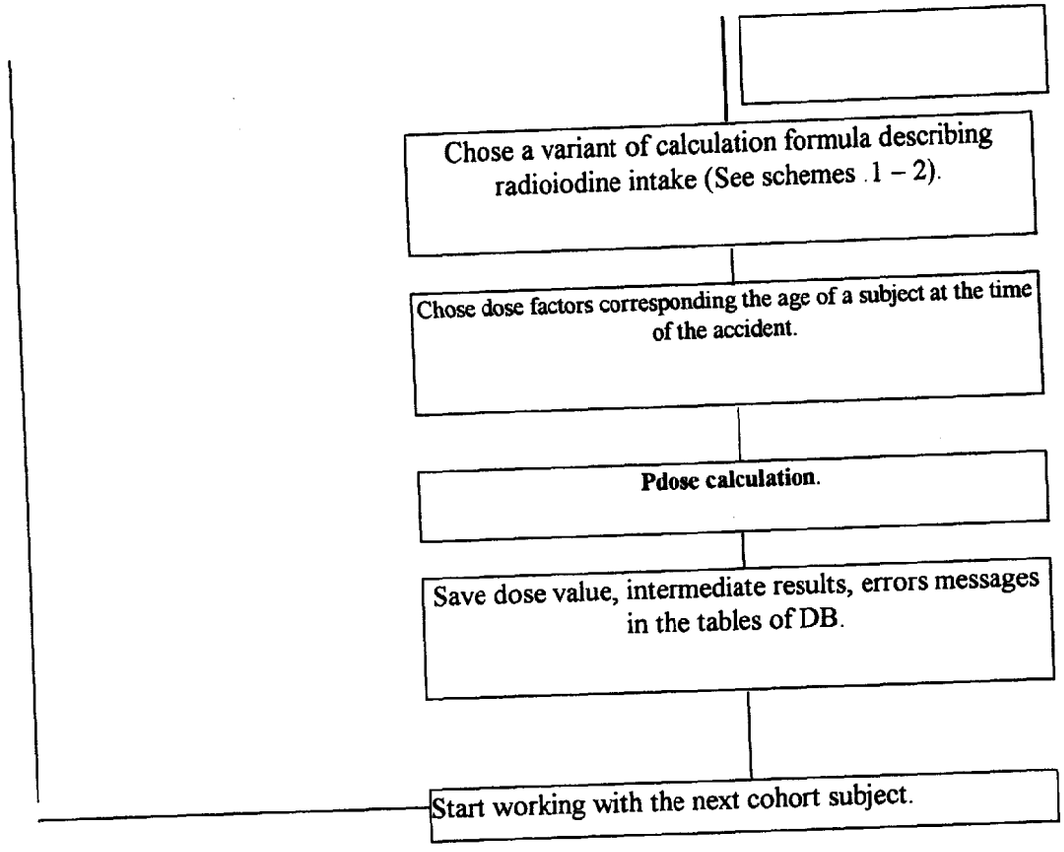


Scheme 26.3. General scheme of program for individual thyroid dose calculation



Scheme 26.3. General scheme of program for individual thyroid dose calculation

Continuation.



1.4. Estimation of starting date of $^{131}I$ intaketo the body.

While estimating starting date of $^{131}I$ intake it is agreed that contamination of the territory of Belarus is described by one day fallout - April 26 in Brest oblast, April 27 in South of Gomel oblast, and April 28 in North of Gomel oblast and Mogilev oblast [4, 5].
It is also agreed that pasture period started before the moment of main $^{131}I$ fallout. This supposition is introduced for compensation of missed information, because in the former questioners there was no question regarding the starting date of cattle pasturing. Thus, for the cohort subjects who lived on contaminated territory at the time of the accident starting date of $^{131}I$ intake isstarting date of $^{131}I$ fallout.

For the cohort subjects who did not live on contaminated territories but visited settlements located on contaminated territories starting date of $^{131}I$ intake to the body is the date of arrival to the contaminated settlement

At present there is no complete list of settlements located on conntaminated territories. That is why settlements belonged to the administrative rajons mentioned in the Table 26.2 are considered as contaminated

**Table26.2.** List of rajons considered as contaminated territory with $^{131}I$, and starting dates of $^{131}I$ fallout.

| Oblast | Rajon | Starting date of $^{131}I$ fallout in given rajor |
|---|---|---|
| Brest | Luninets | 26.04.86 |
| Brest | Pinsk | 26.04.86 |
| Brest | Stolin | 26.04.86 |
| Gomel | Bragin | 26.04.86 |
| Gomel | Buda-Koshelevo | 28.04.86 |
| Gomel | Vetka | 28.04.86 |
| Gomel | Gomel | 28.04.86 |
| Gomel | Dobrush | 28.04.86 |
| Gomel | Elsk | 26.04.86 |
| Gomel | Korma | 28.04.86 |
| Gomel | Leltchitsy | 26.04.86 |
| Gomel | Loev | 26.04.86 |
| Gomel | Narovlia | 26.04.86 |
| Gomel | Octiabrsk | 27.04.86 |
| Gomel | Petricov | 27.04.86 |
| Gomel | Retchitsa | 26.04.86 |
| Gomel | Rogachev | 28.04.86 |
| Gomel | Khojniki | 26.04.86 |
| Gomel | Chechersk | 28.04.86 |
| Mogilev | Byhov | 28.04.86 |
| Mogilev | Climovichi | 28.04.86 |
| Mogilev | Costucovichi | 28.04.86 |
| Mogilev | Krasnopolie | 28.04.86 |
| Mogilev | Mogilev | 28.04.86 |
| Mogilev | Slavgorod | 28.04.86 |

| | | |
|---|---|---|
| Mogilev | Chericov | 28.04.86 |

In the proogram of individual thyroid dose calculation estimation of the starting date of $^{131}I$ intake to the body is performed in the following sequence:

1. Identification of address at the time of the accident
2. Check with the list of contaminated territories
3. If place of subject's residence is in the list of contaminated territories, starting date of $^{131}I$ intake to the body is the date of $^{131}I$ fallout in corresponding rajon.
4. If place of subject's residence is not in the list of contaminated territories Table Departure86 is checked, i.e. wether subject moved from the place of residence in 1986. If no, starting date of $^{131}I$ intake is 28.04.86.
5. If there are any records in the Tble Departure86 minimal date of arrival to the place of relocation. If this date is more than 31.05.86 it is considered that the subject did not move anywhere during the whole iodine period, and starting date of $^{131}I$ is 28.04.86.
6. If minimal date of arrival to the place of relocation is less than 31.05.86. addresses of relocation are checked in the list of contaminated territories.

If address of relocation is in the list of contaminated territories starting date of $^{131}I$ intake to the body is equal to the date of arrival to the place of relocation.

1.5.Estimation of of milk consumption ceasing

.Estimation of of milk consumption ceasing is the most complicated for estimation date. It is caused by lack in former questioneers question of local milk consumption ceasing. While calculating doses for 100 subjects in the fourth quarter 1998 estimation of the date of milk consumption ceasing was performed manually.

At present estimation of of milk consumption ceasing is performed through review of three tables of dosimetry data base in the following sequence.

1. Get value of MilkAferAvAsk field in Patients Table;
2. If milk consumption following the accident had been changed - code 0;
3. Check MilkBeforeAv Table for given subject records
4. Get maximum date in EndDate field of MilkBeforeAv; Table
5. If EndDate field has the value of Null type;

check ApproximEndDate field. In given field approximate interval of local milk consumption ceasing is kept. As far as we need exact dates for calculation program, intervals of April-May 1986 are approximated by the following dates:

End of April – 29.04.86
Beginning of May – 05.05.86
Middle of May – 15.05.86
End of May – 25.05.86

6. Check MilkAfterAv Table for given subject records
7. Get maximum date in EndDate field of MilkAfterAv; Table
8. If EndDate field has the value of Null type;

check ApproximEndDate field. In given field approximate interval of local milk consumption ceasing following the announcement of the accident is kept. Intervals are substituted by the dates in accordance with item 5.

9. Obtained date is considered as a date of milk consumption ceasing
10. If the fields mentioned in items 9-10 are empty the date of milk consumption ceasing are considered as a dates taken from MilkBeforeAv; Table.

11 In the former questioners the question concerning milk consumption ceasing was implemented as a question of milk consumption ceasing after the subject had been awared of the accident. It also contained a date when subject had been awared of the accident. This date when estimating the date of milk consumption ceasing was used as reper date. If the date of milk consumption ceasing obtained from two tables: MilkBeforeAv and MilkAfterAv, is less than given reper date, so given reper date is considered as the date of milk consumption.

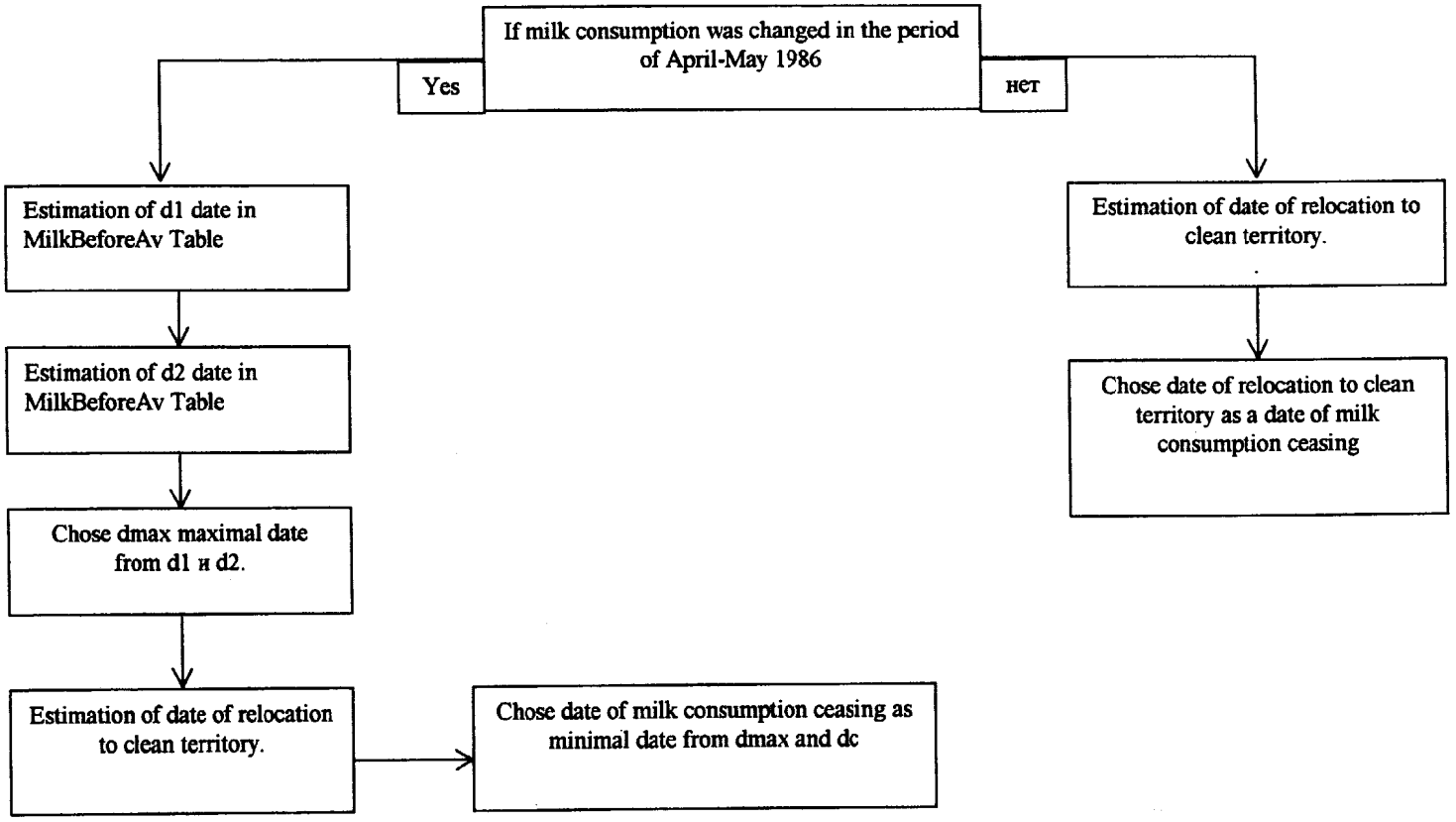
Than a check is performed with respect to the subject leaving contaminated territory for clean one or vice versa. For short term movements of the subject from clean territory to contaminated one A8 calculative formula is used and the date of leaving of contaminated territory is considered as a date of milk consumption ceasing. At given stage duration of subject's staying in contaminated territory is estimated as a difference between minimal date of arrival to contaminated territory and maximal date of leaving of contaminated territory for the whole period of April-May 1986. It means that for cohort subjects living in cllean territories at the time of the accident and visiting contaminated settlements the dose will be higher than actual. Individual dose calculation as a sum of doses received when visiting contaminated territory has not been implemented at the given stage. Dates obtained above are not used for the given variant of radioiodine intake to the body.

For cohort subjects who lived in contaminated territories check for their movements to clean territory was performed the following way:

- Check Departure86 Table for given subject's records, i.e. if there are movements from the place of residence in
- If there are records, a minimal date of arrival to the place of relocation is estimated. If this date is over 31.05.86 it is considered that the subject had no moved anywhere
- If a minimal date of subject's arrival to place of relocation is less than 31.05. 86. Addresses of relocation are checked through the list of addresses in contaminated territories
- If address of relocation is not found in the list of contaminated settlements, the date corresponding to the place of relocation in the clean territory is considered as a date of milk consumption ceasing with minimal date of arrival for the period of April-May 1986. This date is a date of contaminated milk consumption ceasing. If the date of relocation to the clean territory is less than the date obtained in items 9-10, so given date is considered as a date of milk consumption ceasing.

Scheme for estimation of date of milk consumption ceasing is presented in Scheme .4

Scheme 4. Estimation of a date of milk consumption ceasing.



1.6. Estimation of starting date of iodine prophylaxis

Estimation of starting date of iodine prophylaxis is performed in a following sequence:

1. Get the volume of IodProphylaxisAsk field in Patients Table;
2. If iodine prophylaxis has been performed: – code 1;
3. Minimal date is estimated in Date_Iod field of Iodine_Pod_Calend Table;
4. If Date_Iod field contains a value of Null type
5. 4 fields with approximate intervals of stable iodine consumption from IodineProphylaxis Table are used. Exact date from time intervals is estimated the same way as described in i.1.5.

1.7. Estimation of date iodine prophylaxis ceasing

Estimation of date iodine prophylaxis ceasing is performed in a following sequence:

1. Get the volume of IodProphylaxisAsk field in Patients;
2. If iodine prophylaxis has been performed: – code 1;
3. Maximal date is estimated in Date_Iod field of Iodine_Pod_Calend Table
4. If Date_Iod field contains a value of Null type
5. 4 fields with approximate intervals of stable iodine consumption from IodineProphylaxis Table are used. Exact date from time intervals is estimated the same way as described in i.1.5.;
6. Calculate number stable iodine intakes
7. Calculate the difference between starting date of iodine prophylaxis and date of ceasing;
8. If the number of stable iodine intakes is less than the difference between starting date of iodine prophylaxis and date of ceasing, the date of iodine prophylaxis ceasing is estimated in accordance with the formula: date of ceasing = starting date + number of stable iodine intakes +1day

1 day is added to the date of ceasing because it is agreed that blocking effect of stable iodine is lasted 1 day after the intake.

1.8. Estimation of date of thyroid exposure dose rate measurement.

Date of measurement of thyroid exposure dose rate is estimated by the value of "MEAS_DATE" field in the table of data base of direct measurements. If "MEAS_DATE" field is empty it is agreed default that date of measurement is 31.05.86r.

1.9. Estimation of date of leaving contaminated territory for clean one

Estimation of date of leaving contaminated territory for clean one is described in items 1.4-1.5.

2. Review of errors while using dose calculation software.

Processing of large amount of information tabulated in different tables of data base initially suppose to types of errors appeared while entering information to the data base: (1) missed data in the fields of tables, (2) entered data exceed the range of values.

In the program of individual dose calculation there is a number of key variables which values could not be indefinite. In case if the value for the variable obtained from the table of data base is not determined calculation program stops working. That is why in the program of individual dose calculation there is a block of errors processing which which is implemented int two directions: (1) CalculationDose Error Table fixes messages of errors for the fields which values are empty or exceed the range of values. These messages are of two types

- «Lack of value in the field «name of a field»!»;
- «Exceed the range of values in the field «Name of a field»!»;

(2) a number of defoults is introduced for variables which values are to be definite. Given variables correspond to the following fields:
Data base of direct measurements:
MEAS_DATE := 31.05.86
RATE:= 1 мсR/h
Dosimetry data base:
BirthDay = 01.05.81
OblastCode_Av = 1505
RaiontCode_Av = 203

3. Dose calculation

Following estimation of above mentioned dates (items: 1.5-1.9) time intervals are estimated between these dates and starting date of fallout. Time interval is expressed in days. Now, a variant of kynetic function for a taken cohort subject is calculated in accordance with the schemes 26.1 and 26.2 and obtained time intervals. Values of kynetic function, dose coefficient, and dose rate are multiplied.
The result is entered to DirectDose field of Pacients Table.
By now using this program thyroid doses have been calculated for 2718 cohort subjects

4. . Veryfication of algorythm through manual calculations for 5 subjects.

Selection of 5 subjects for manual calculation of individual thyroid dose was performed through the bulk of 2718 records. It was sorted according to ID number and each 500 record from Patient Table was chosen. Such method of selection could be considered as pseudorandom becouse the ID numbers of interviewed cohort subjects are in the range of 131 – 205924 i.e. they cover all data base of direct measurement. Table 26.3 presents the results of individual thyroid dose calculation made automatically, manually, and doses provided by Institute of Biophysics.

Table 26.3. Comparison of the results of calculations made automatically and manually

| ID | Type of calculation formula | Automatically calculated dose, ram | Manually calculated dose, ram | Institute of Biophysics dose, ram |
|---|---|---|---|---|
| 48152 | A.6 | 184.5 | 184.5 | 55 |
| 65376 | A.6 | 119 | 119 | 120 |
| 89084 | (A.1+A.2)/2 | 0.4 | 0.4 | 5.06 |
| 123994 | A.2 | 227.9 | 227.9 | 240 |
| 183744 | A.2 | 107.9 | 107.9 | 130 |

Types of calculation formulas, obtained by the program of individual dose calculation and those estimated manually are the same because it is easy to estimate calculation formulas for chosen cohort subjects. None of 5 subjects had iodine prophylaxis. Milk consumption ceasing caused by relocation to clean territory was in two subjects, and is described by formula A6. The rest of subjects did not cease milk consumption during the whole iodine period. For two subjects lived in contaminated territories radioiodine intake is described by A.2 formula. For one subject lived in Minsk inhalational component of dose is added

In given formulas only two time parameters are used: date of measurement of thyroid exposure dose rate, and date of milk consumption ceasing. Date of exposure dose rate is taken from the the data base of direct measurements. Date of milk consumption ceasing is estimated as a date of coming to clean territory. When chosen calculation formulas are the same and time intervals are the same dose values are also the same.

Comparison of obtained values with doses received by Institute of Biophysics showed two deviations. For subject ID = 89084 in the data base of direct measurements both measured dose rate and *скорректированной* are absent. Default dose rate is considered equal to 1 mcR/h that is much less than SRP-68-01P measurement error. More than 3 fold increase of calculated dose over the dose of Institute of Biophysics in subject ID= 48152 require further investigation.

**Milestone 27: Design of part of the query software for dosimetry data base.**

Query subsystems of dosimetry data base created at this stage of work are aimed at implementation of two basic tasks:

1. Quality control of entered data of individual interview;
2. Find deviations between data of individual interview and the data from the data base of direct measurements, i.e. confirm or refute that interviewed subject belongs to the cohort.

Development of query software for dosimetry data base was performed through method "*query according to the sample*", in MSDB, Microsoft Access. 12 inquiries have been worked out and stored in dosimetry DB for the purpose of solving ov above mentioned tasks. Tables of dosimetry DB and DB of direct measurements prepared by Institute of Biophysics are linked by relationship "one-to-one" through key field (PatientID – for the tables of dosimetry DB and ID – for DB of direct measurements). Operation of these inquires is tested on the bulk of 2718 records.

Quality control of entered to the data base interview data is performed through 8 inquires answering the following questions:

1. Find incompletely entered questioners through blank Specialist field of Patients Table (Ex., implementation of this inquiry found out 42 cases from 2718);
2. Find blank values in BirthDay field (Patients Table) (55 from 2718);
3. Find blank values in the fields containing the information of current address (Patients Table) (235 from 2718);
4. Find blank values in the fields containing the information of address at the moment of the accident (Patients Table) (221 from 2718);
5. Find blank values in the fields containing exact or aproximate starting date of iodine prophylaxis (IodineProphylaxis Table), If iodine prophylaxis had been performed*) (12 from 466);*
6. Find existing not blank fields in *MilkFoods* table for ID for whom values of field Milk Foods of Patient table neglect consumption of milk food staffs *(25 from 2384);*
7. Find existing not blank fields in *Vegetables* table for ID for whom values of field Milk Foods of Patient table neglect consumption of green leaf vegetables *(47 from 1796);*
8. Find records in Departure86 Table when the value of Arrival86DateIn field is less than the value of Departure86Since field (i.e. date of departure is less than date of arrival -27 from 5346).

Membership of interviewed subject to the cohort veryfied through four inquires answering the following questions:

1. Family name of a subject of dosimetry DB differs from family name in DB of direct measurements (182 from 2718);
2. Date of birth of a subject of dosimetry DB differs from date of birth in DB of direct measurements (54 from 2718);
3. Place of residence at the time of the accident (rajon, settlement) in dosimetry DB differs from place of residence at the time of the accident in DB of direct measurements. By now this inquire has not been implemented yet. It is necessary to

bring the names of settlements used in the DB of direct measurements to the names of dosimetry DB;

4. Starting date of iodine prophylaxis in the dosimetry DB differs from starting date of iodine prophylaxis in the DB of direct measurements (431 from 463).

As a result of inquiries and following talks to operators of data entry one could make a conclusion of the following systematic errors:

- Subject can not remember date of burth if he/she comes to examination without parents;
- List of settlements in DCC is incomplete for data entry
- Names of settlements used in the DB of direct measurements are not the same as in DCC lists of settlements

These systematic errors could be corrected by entering date of birth from DB of DCC, having the right to make changes to the list of settlements used by DCC, and veryfication of settlements of DB of direct measurements on the base of the list of settlements of DCC.

The rest of errors are of occasional nature and could not be corrected automatically. That is why veryfication should be done manually for each questioner in which errors have been found in course of query software operation.

**Milestone 28: Study by means Monte-Carlo method the effect on the DP-5 readings of distance between detector-neck for subject of different ages.**

Review of uncertaintes of thyroid direct measurements performed in May-June 1986 in Belarus is of great importance for successful implementation of epidemiological thyroid studies. It is caused by the fact that estimation of radiationally induced thyroid cancer needs more precise and reliable doses of thyroid exposure.

The results presented in given report have been obtained by modelling via Monte-Carlo method DP-5 response to γ-radiation of radionuclides incorporated in the human body. Development of DP-5 detector model, modeling of its response, mathimatical phantoms of human body used in calculations have been described in previous reports of dosimetry group of BelAm Project and in [6, 7]. For calculations universal program MCNP [8] for calculation via Monrte-Carlo method transfer of γ-quants and electrones in human body and in detector.

Calculation of DP-5 detector response was performed for 5 phantoms corresponding to 1, 5, 10, 15 years old and adult. Description of human body phantoms and thyroid could be found in [9, 10]. Analogue method of calculation was used for $10^7$ positions for the phantoms and detector. Detector response was calculated in the following distances between neck and detector 1, 2, 5, and 10 cm. Detector was considered in normal position, closed window aimed at neck. $^{131}I$ was considered as a source radioisotope incorporated in thyroid.

The following results have been obtained. Fig 11 presents calculated absolute values of detector efficiency according to the age and distance between neck and detector. Values of statistical error of calculations presented in the fig 11 correspond to соответствуют доверительной вероятности P=0.95. It is evident from the figure in the range of distances 0 –2 cm efficiency of registration varies 2 – 2.5 times depending on age. Besides, increasing the distance age dependance of registration efficiency decreases – Ratio of registration efficiency for one year child and for adult while measuring close is 1.75, and from 10 cm –1.45.

Fig 13 presents dependance from distance "neck-detector" for relative response of DP-5, i.e. efficiency of registration for distance 0 cm – $\eta(x)/\eta(0)$. Values presented in Fig.

14 show that maximal deviations with respect to relative response caused by age dependance are comparatevely low 8, 12, 25 и 23% for distances of 1, 2, 5, 10 cm. As far as distance "neck-detector" laying in the range 0 – 2 cm is of most interest so the calibration factor of DP-5 for $^{131}I$ could be described without loss of accuracy using unique function for all ages.

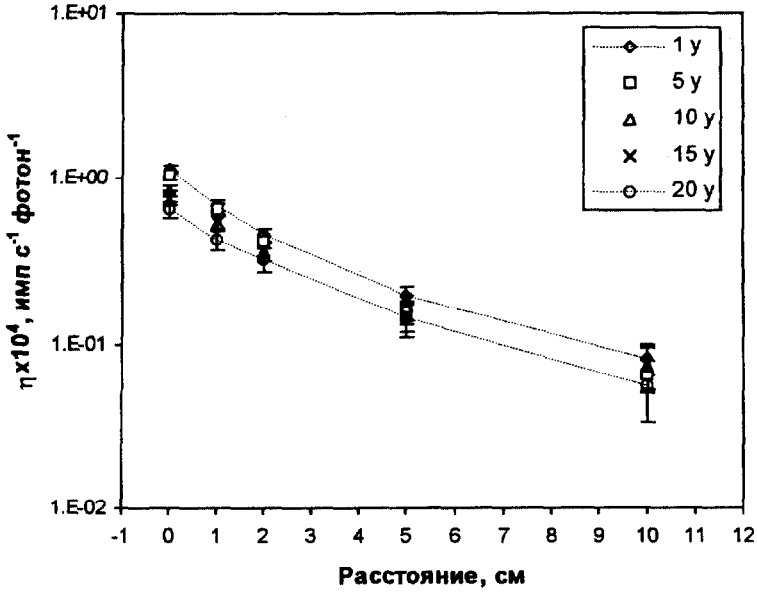



**Fig. 13. Dependance of absolute efficiency of detector registration from the distance"neck-detector" For five phantoms of different age.**

For analytical description of relative dependence of calculated efficiency values from distance the following function was used.

$$f(x) = \frac{1}{ax^b + 1},$$

When a=0.538 $cm^{-1}$ and b=1.3.

Analytical function f(x) with such parameters could be used as sizeless correction factor allowing to consider changes in registration efficiency of DP-5 detector while changing distance "neck-detector". It should be considered that error of analytical approximation because of ignoring of age dependence does not exceed 12-15% in the range 0-2 cm. At the same time in large distances error increases and in the in the range of 2-10 cm does not exceed 25-30%.

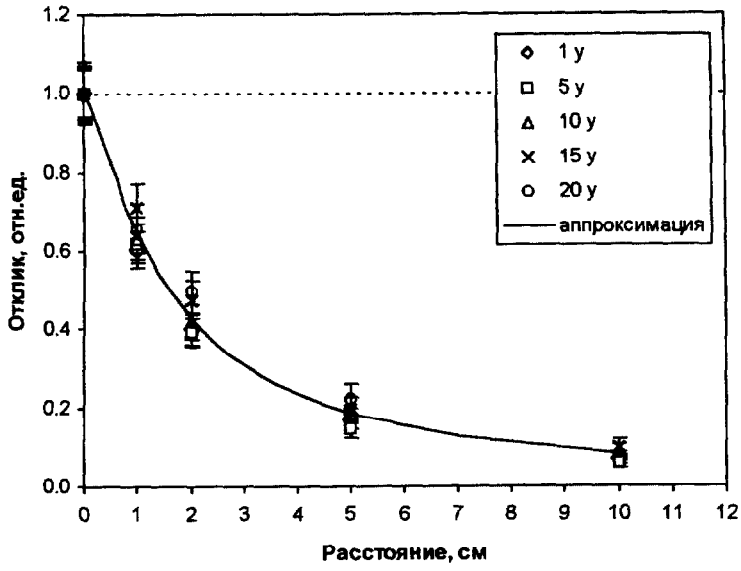



**Fig. 14. Dependence of relative change of Dp-5 response to $^{131}I$ in thyroid from distance "neck-detector"**

**Milestone 29: Preparation of manuscripts for the ISTC meeting.**

In the period of May 17 - 22, 1999 International Workshop "Conversion of Scientific Studies in Belarus in the framework of ICTC activity" will take place in National Scademy of Sciences, Minsk. Dosimetry Group has prepared an abstract concerning BelAm activity to be presented for international scientific community. The abstract has been sent to Organizational Committee of the Workshop

# RECONSTRUCTING THYROID DOSES: THE BELARUSIAN - AMERICAN COHORT STUDY OF THYROID DISEASE AMONG THE CHILDREN AND ADOLESCEENCES AS A RESULT OF THE CHERNOBYL ACCIDENT

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Childhood-thyroid cancer has become the most significant consequence of the Chernobyl accident for the inhabitants of Belarus. More than 700 cases have already been registered in those aged 0-18 at the time of the accident. It is nearly forty times greater then the number of the detected cancers for similar period of time before the accident. Understanding the reasons for the unexpected large increase of children's cancers following the Chernobyl accident has become the subject of the Belarusian-American joint study.

Repeated examinations of 15,000 subjects for at least 20 years are to be conducted within the framework of this study. The subjects that are beeng screened were selected from the group of approximately 40,000 children with the direct thyroid measurements (measurements of exposure rates against their neck that were performed within a few weeks after the accident in order to provide estimates of the $^{131}I$ content of their thyroid at the time of measurement). Preliminary estimates of thyroid doses for all the subjects were made earlier by the Institute of Biophysics (Moscow) using the data of direct thyroid measurements. Now, a reevaluation of the preliminary estimates is being performed for the subjects that were screened on the basis of the additional information on radioactive iodine fallouts, conditions of measurements and answers of personal interviews as regard to lifestyle at the first weeks after the accident.

REFERENCE:

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# ПРИЛОЖЕНИЕ

# APPENDIX

### 5.2.1 Interview

By the time of interview the subject should have self-interview form with him-(her) self received together with appointment letter by mail

The interviewer will welcome the subject and the accompanying parent and explain the purpose of the interview. Interviewer will ask if the subject has completed self-interview form, and take it. The interviewer will remove bar-code label with subject's ID from the subject's envelope, label interview form, and proceed with the interview.

When intial subject's visit the interviewer will fill in Initial Interview Form. This form is designed to be administered primarily to the parents or someone who live with the subject at the time of the accident and knowlegeable about subject's staying, behavior, food preparation, iodine prophylaxis at the period of April-May 1986

If the subject comes with accompaneers interviewer will administer the questionnairs with them. In the course of the interview the interviewer will review self-interview form (if the subject brings it) and, if necessary, clarify unclear moments.

If the subject comes alone, the interviewer will proceed the following way. The interviewer will fill in Initial Interview Form using self-interview form, and, if possible, clarify unclear moment asking subject. If the subject has not got self-interview form (or this form is not adequatly completed) the intrviewer considering subject's age at the time of the accident will decide whether could answer this or that questions of the questionnair. If the subject was to young at the time of the accident and can not answer the questions referred to April-May 1986 the quality of performed interview will considered as usatisfactory. The interviewer will ask the subject not to forget to bring self-interview form in subsequent visit (or try to give more comprehensive answers to the questions of self-interview form)

In subsequent years of the study the interviewer will complete Annual Interview Form. In the course of subsequent interviews the interviewer will have the data of initial interview presented as a hard copy, and in future – as a computer data base. In subsequent interview the interviewer will ask only questions to which the answer was not received at all (or «do not remember»), or the answer was not complete during the initial interview. If by the time of subsequent interview administration the interviewer does not has the data of initial interview, the subject will be asked all the questions from the Annual Interview Form

While administering subsequent interview in situation when the subject comes alone the interviewer will act the same way as when administering initial questionnaire. The difference between Initial Interview Form and Annual Interview Form is only in the number of questions but not in their contents.

If the interview is administered with the subject «exposed in utero» (or the subject was at breast feeding in the period of iodine attack), the interviewer will ask the mother and complete Mother Interview Form. If mother is not available the interviewer wil complete Mother Interview Form using self-interview form. If self-interview form is absent (or actually is not completed), the Mother Interview Form will remain to be incompleted. Interviewer will ask the subject not to forget to bring self-interview form in subsequent visit ( or try to give more comprehensive answers to the questions of self-interview form)

At the end of the interview the control Form will be marked to show that the interview was completed. The subject will be thanked for his contribution and directed to the next station.

### 8.3. Death

All deaths occuring among members of the study cohort will be identified and the couse of death will be determined by review of death records in Registar's Offices and medical records (histoty of disease, patient's chart) The aforementioned review of death and medical records will be carried out by the personnel of the epidemiology group. The data will be coded by epidemiologists and keyed to the form of Medical Death Certificate and Epidemiological data base (morbidity).

### 8.3.1. Notification of study of subject death

**DEATH WILL BE ASCERTAINED IN A NUMBER OF WAYS**
THESE INCLUDE:

- Notification by the family. This may happen in response to the letter sent to the subjec to schedule an appointment;
- Follow-up of thyroid cancers diagnosed as part of the study procedures;
- Notification from the local polyclinic and hospitals according to the lists of subjects provided to medical institution for screening examination of subjects in its jurisdiction;
- Data from Address Offices and Passport Offices about place of residence of cohort;
- Datab from Oblast Register's Offices.

### 8.3.2. Obtaining pertinent records

For each study subject who dies during the course of the study, information regarding the cause of death will be obtained. First, a copy of death certificate will be obtained. If the subject dies of disease, a copy of any terminal hospital record will obtained for review or will be abstracted. If an autopsy has been performed, and thyroid tissues retained, it will be sought to obtain a block of thyroid tissue. If death is related to thyroid cancer or to metastasis from a primary thyroid cancer, full clinical details will be sought from any hospitals where the subject was treated, and will be documented on the form of medical death certificate.

### 8.3.3. Expert review of death data

At periodic intervals of 4 years files on deaths occuring in that period will be reviewed by an expert group appointed by the director and representing in each concret case relevant medical specialities including endocrinology, pathology, surgery and internal medicine.

**Appendix**

## Quality Control of Data

During the course of the study there are some sources of errors origin:

- Deviation from the scientific protocol or its wrong interpretation while performing examination, measurement, and creating primary documents;
- Uncallibrated or wrong instrument;
- Wrong or incomplete filling of paper forms;
- Wrong or incomplete data transfer from paper to computer;
- Errors or data missing while transfer information from the units to DCC;
- Impossibility to get primary documents confirming obtained data (e.g. death record, laboratory reports;
- Inadequate staff training;
- Intentional distortion of data;
- Errors in summarising data and compiling reports;
- Wrong usage of statistical software or application of irrelevant statistical methods.

To prevent such error periodic reports should be prepared with respect to timelyness, completeness, adequasy of collected data.

### 1. Data need to be reviewed.

Correctness of data is depended from the level of personnel training and its familiarization with the study protocol. DCC has created united computer system which includes identification of those who examine subjects, complete forms, enter data. To certificated personnel an identificator is attached which will be used for control. Data presented by uncertificated personnel could be excluded from the data base or marked with a flag informing that quality of data could be insufficient.

There are several types of data subjected to control:

- Data easy to control are under the constant control (field of date type, numerical fields, text fields)
- Data controlled periodically in fixed moment of time.

Sequence of data control includes the following steps:

- Control of types of data and their range inside each form at the moment of data entry
- Logical control of data inside a form
- Logical control of data between the forms of one visit
- Logical control of data between the visits for the whole period of time

### 1.1 Control during data entry

1.1.1 Data entry for a definite subject is first of all entry of patient's ID which is unique six-figures number. Any paper form with the data to the study subject is labeled with bar-code label which is entered to the computer by bar-code reader. Such approach minimize the level of errors at the stage of entry. The same procedure is observed while entering ID of blood and urine samples.

1.1.2 Control of time and date fields. DB software allows to control the correctness of data entry of the field date. For example, date 30.02.99 will be not permitted to enter. While entering the date of birth time interval corresponding to the requirements of the study protocol is under control (subject's age at the moment of the accident should be 0-18). The date of contact with the subject, date of visit, date of hospitalisation are under control. There is also control of relation between date of visit and date of referral to hospitalization, date of visit and date of making of diagnosis.

1.1.3 Control of letteral fields is performed through setting input masks which prevent from entry any symbols except letters.

1.1.4 Numerical data are controled for admission and interval. In case of strict control data entry is canceled, in other cases a warning message is sent to operator and data entry is continued. In the course of the study permitable ranges could be changed because of some reasons (for example, when changing reagents for tests). Such changes should be documented in the registration log reflecting the date and the cause of made changes.

1.1.5 Frequently met and difficult for entry data from the point of view ofarising of additional errors data are formalized collected to referrence information (settlements, diagnoses, personnel codes, etc.). Availability of such information allows to minimize data entry errors because operator select information from suggested list but not enter it manually.

1.2 **Control of data when transferring them from the units to DCC**

It is evident that study data are entered both in the units of the project (Screening Center, Central Laboratory, Dozimetry Group) and in DCC. The task is to channel the data from the project units into the DCC. So the problem arises to control data, correct them and synchronise data bases.

To solve these tasks DCC has developed softwares allowing to channel data from the units to DCC.

The critical moment is that the structure and types of data are to be transferred should be absolutely identical in project units and in DCC. Otherwise, personnel will obviously loose data. To perform data channel so called archive DBs have been developed. These DBs contain data newly entered in the project units or subjected to some correction. These records are marked with a flag that permits to recognise them from those transferred previously. Specially developed software selects records that have to be transferred to DCC and copy them to archive DB. Then worked records are marked with flag showing that given information is transferred to DCC. DCC staff copy the data to the discs and bring them to DCC. At present a possibility for channel of archive DBs via modem through telephone lines is under consideration.

In DCC the data are copied from the discs to archive DB of DCC and automatically added to the central DB of the study. In the process of data addition they are controled for compatibility, i.e. new records are introduced to the DB, and records corrected in the project units and available in DCC are renewed.

This is the way of synchronization of units' Dbs with DCC DB. Further control and edit of data entered in the units is performed through inquire generated in DCC and directed to the project units where data correction is performed, marking with flag showing that these data are to be tranferred to DCC, and further channel to DCC.

**1.3 Edit of DCC Central DB**

As was mentioned above, data come to the study DB in two ways, i.e. data entry to the local DB of the unit, and then data transfer to the study DB. Data edit is performed in DCC. Data from the forms of one subject for definite visit is controled through the following parameters:

- All the forms are marked with ID bar-code of the subject
- All expecting forms for given patient for definite visit have been received and enterd to DB.;
- All data for a patient have been receive in admissible time interval of the visit;

Control for missed forms inside one visit suggests correctly entered date of visit in all expecting forms, because ID of a subject and and date of a visit are unique identifier of a visit. That is why software for screening data entry is developed in such a way that operator enters manually the date of a visit only once when entering Locator Form. Entry of the rest of screening forms of a subject for a definite visit is based on entered date from the Locator Form that is selected automatically. Operator does not have a possibility to enter any form of the visit if Locator form is absent. Given approach significantly decrease the number of mistakes while entering the date of the visit.

To follow missed forms DCC has worked out a special software which is run once a week. As a result a report is generated about missing forms. This report is passed to the project units where entry of forms is conducted.
This program makes possible to reviale missed forms which are completed in the screening center directly at the moment of examination. These forms are: Control Form, Locator Form, Ultrasound Examination Form, Palpation Examination Form, Medical Interview Form, Blood Collection Form, Urine Collection Form, Interview Form, Preliminary and Final Summaries.
For cases when a subject is refferred to hospitalization to Acsacovschina Clinic or Centerof Thyroid Oncopathology a task arises to follow Hospitalization clinical and Hospitalization surgury forms, Pathomorphological form, because getting of these forms is expected in definite time interval and referred to definite visit.
(Algorithm for following of missed clinical forms was presented in the report for the 4-th quarter of 1998).
The same procedure is used for the forms of laboratory blood tests where ID of the subject and ID of the sample identify relation between form of blood collection and form of blood tests.
As soon as forms have been checked inside a visit the next chec is performed according to time parameters:

- All the data obtained for the subject of the study have identificating code, stored in the DB;
- All the data are ajusted according to age and sex;
- Sequence of number of visits and testing dates is correct.

Relationship is checked between date of visit, date of birth, date of diagnosis. Comparison of dates between forms completed during the course of the visit and in the course of the whole period could be done in chronological order of the events.
After performing control for missing forms inside a visit DCC personnel together with group leaders and experts will decide which data should be cheked, content and sequence of this check.
(A whole range of algorithms developed for such procedures was presented in the report for the 4-th quarter of 1998)

DB editting could be performed before DB will be copied for data review and reports generation. These checks are very complicated and could not be performed during entry.

**2. Solution of revialed contradictions**

2.1 Content of inquiries
DCC collects wrong data in reports to be sent to the project units through inquiries, i.e. reports of contradictive data are sent to unit for conformation or correction. Fig. 13 presents a scheme of inquiry move from DCC to the project units..

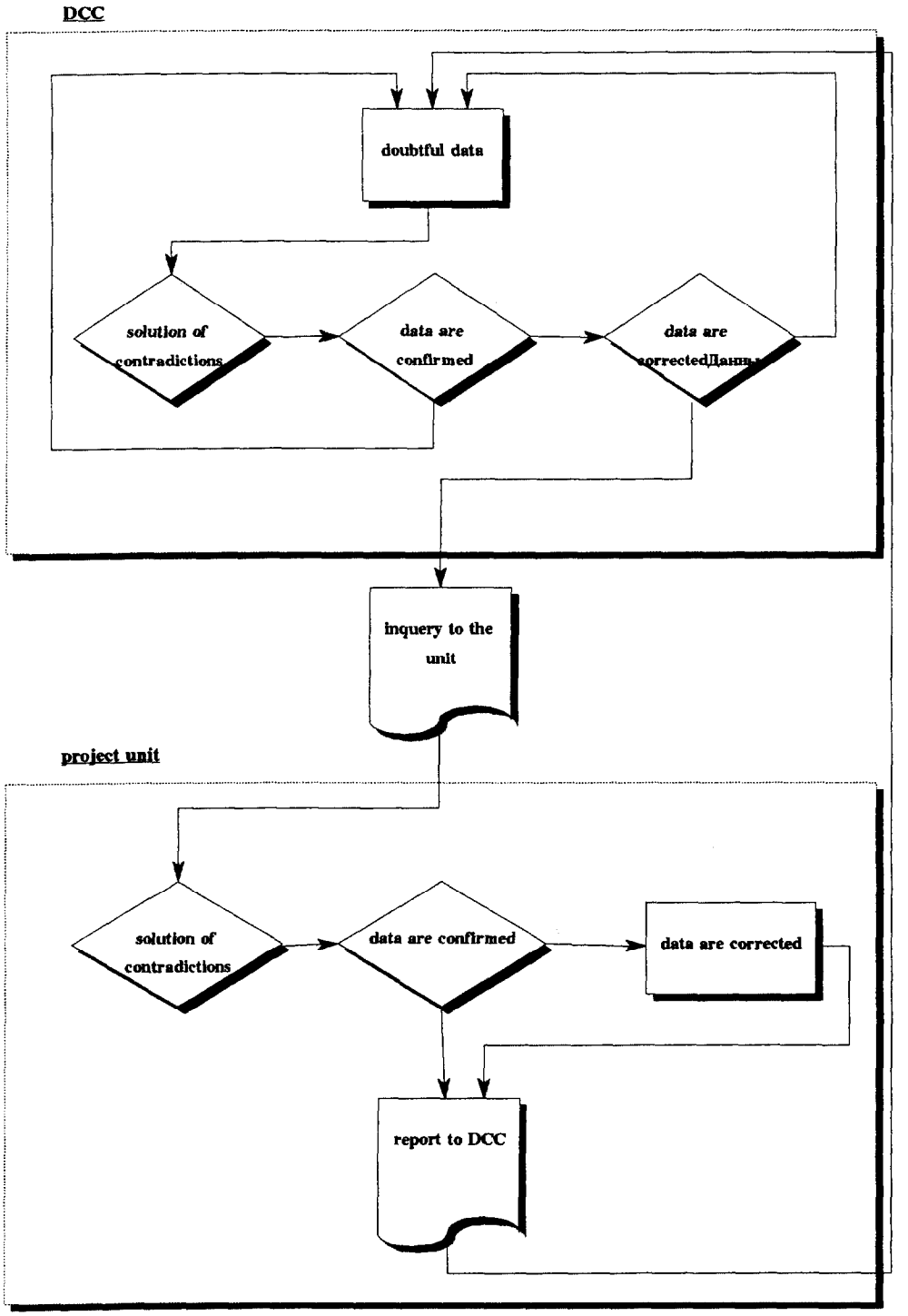


**Fig.13 Scheme of inquery move from DCC to the project units.**

The inquery includes identificational heading, section with a request from DCC, section with the response from the project unit, documental sectionfor DCC. The inqueries are prepared by DCC personnel manually or by special software.

# Quality Control of Computer Equipment

Each project unit uses PCs for mainteining of DBs and preparing scientific reports. That is why special attention should be paid to reliability of computer equipment, system, standard, network, and applied softwares. Given section contains description of procedures for optimization as well as finding and solution of problems of softwares and units of PCs operating under the administration of Windows 95 system.

## 1. Optimization of personal computers operating under the administration of Windows 95

Windows 95 structure is significantly updated in comparison with previous versions of Windows. It allows to increase the capacity of the system. Numorous components of Windows 95 could perform dynamic self-adjustment decreasing or eliminating the necessity of adjustment from the side of user. These components are:

- Dynamic swap files and dynamic cesh files;
- 32-bites access to files and hard disks;
- background tasks to print;
- automatic adjustment of system in Windows 95;
- installed means for tracing and adjustment of system performance (option System in Control Panel, programs System Monitor and Disk Defragmenter)

### 1.1. System Performance

To review a report of the problems with performance open pictogram System on Control Panel and select option Performance. Windows 95 will inform of current working parameters of the system including wether 32-bites components of protected mode are used. If report informs that for some devices components of real mode are used (particularly for hard disks controllers) it is necessary to take measures to eliminate the problems that prevent from loading of drivers of protected mode.

### 1.2. Optimization of swap file.

Windows 95 uses special swap file on hard disk..While working with virtual memory some part of program code and data are in operational memory and the other part temporary transferred to virtual memory. As soon as this information will be called for Windows 95 will transfer it back to operational memory, and the other data (if necessary) will shift to virtual memory. Such operations are hided, but they could be noticed by intencity of hard disk operation. The principal advantage of virtual memory is that it is possible to run out simulteniously more programs than it is designed by operational memory.

The only thing assuring efficiency of swap file is availability of enough spare place on hard disk, so that when necessary operational system could extand or compress it. Though parameters of swap file provide optimal capacity default, they could be changed. For example, in computer with several hard disks swap file should be placed on disc with highest capacity. If the user loads all software from one disc capacity could be increased placing swap file on one of the discs used less intensively.

To adjust the parameters of swap file of virtual memomory open System pictogram in Control Panel and click option Performance. Click Virtual Memory button. In opened dialog box one could select mode of manual adjustment of virtual memory or automatic administration of operational system.

### 1.3. Optimization of file subsystem.

In Windows 95 disc cache is also dynamic. While configurating the system there is no need to adjust it. That is why a number of commands necessary for Windows 3.x (share, smartdrv) should be delayed from configuraion files.

Cache size is determined by the current situation. If the system very often apply for swap file cache decreases automatically that could cause significant decrease of performance. In such case hard disk could require drive of real mode. One should remember that exchange with swap file through the drive of real mode does not lead to increase of number input-output operations. To prevent loss of capacity caused by the disk drive of real mode it should be renewed to the version operated in protected mode.

Parameters regulating performance of file system are administered only by the user. To optimize capacity of file system open pictogram System in Control Panel and select option Performance. Click File

System button. Select option Hard Drive, and mention usual role of this computer in the list Typical Role Of This Machine. For all PCs used in the Project it is necessary to chose the option Desktop Computer and then click OK button.

For optimization of file system of CD-ROM drive in the same dialog box select File System option chose CD-ROM. Option Supplemental Cache Size should be put to Large, and in the list Optimize Access Pattern For chose the value corresponding to the number of rates of installed CD-ROM drive in given PC.

Troubles shooting options in file system located in dialogue box File System, should be swiched off. Activation of any of these options could significantly decrease system performance. Given parameters could be activated with allowance of DCC representative.

Each PC user should at least once a week check all above mentioned settings for optimization of file system.

**1.4. Optimization of graphical subsystem.**

To check the parameters of graphic acceleration open pictogram System in Control Panel and chose Performance option. Click Graphics button. Index of the Acceleration parameter should be placed in Full position which activates all means of graphics acceleration posessed by videodrive.

**1.5. Optimization of printing subsystem.**

To set parameters for forming printing spool, open pictogram Printers in the window Control Panel, click right button of mouth, and in appiared windos chose Properties. Then select option Details, and click button Spool Settings. While adjusting printing subsystem in Windows 95, it is necessary to find compromise between intencity of hard drive using and time for restoration of program control. Put index of Spool Print Jobs So Program Finishes Printing Faster in one of the following parameters.

- Start Printing After Last Page Is Spooled - if it is necessary to restore program control quickly. It needs more space on hard drive, and prolongates the time of printing. Secondary conversion will not start till the whole EMF file will be formed. This decrease the load to PC but require additional space on hard disc.
- Start Printing After Page Is Spooled - if it is necessary that secondary conversion takes place simulteniously with recording of EMF file. It decreases the time of printing required place on hard disc but increase the time for restoration of program control.

**1.6. Optimization of network maintenance.**

Network maintenance actually does not require adjustment of Windows 95 operational system.. Below are given generation recommendations for administrator of local network under OS NetWare.

- use 32-bites network clients of protected mode. For example, Microsoft Client For Netware Networks is operating much faster than VLM version or NETX Client NetWare.
- Use new NDIS3.1 drives of netwwork adapters, provided directly with Windows 95.

To provide maximal performance of PC maintaining service of division of files and printers it is necessary:

- Provide PC with adequate memory (volume of memory is defined by the size of network and number of users working with the resources of server).
- Trough option System in Control Panel set typical role of PC - Network Server.
- Install high capacity adapter (32-bites) on a server.
- If possible, give atribute "only for reading" to files working with service File and Printer Sharing For NetWare Networks that allows to network client use cache means more effective

**1.7. Optimization of conventional memory.**

For optimization of Conventional Memory the same methods as in MSDOS 6.x :

- in CONFIG.SYS mention himem and emm386 (with ram or noems parameters) and load all drives and appendises using devicehigh or loadhigh operators.
- Delete from CONFIG.SYS and AUTOEXEC.BAT all possible drives of real mode and resident programs, instead of them use new drives of protected mode created for Windows 95.

- Use buffershigh, fcbshigh, fileshigh, lastdrivehigh, stackshigh operators backing up memory in upper memory blocks UMB.
- To load drives of real mode in UMB use MEMMAKER utility supplied with MSDOS 6.x.

**2. Procedures for troubles finding and shooting.**

The following procedures belong to prcedures of troubles finding and shooting

- Check specific problems that could occure with drive.
- Check files versions.
- Check availability of system files.
- Delete unnecessary drives.
- Check availability of necessary drives.
- Check records in start up files
- Check conflicts when starting sistem
- Check configuration of devices.
- Check procedures of disk maintenance
- Monitoring of equipment capacities, service components, and appendises.

Initial eight procedures are usually performed at the stage of Windows 95 installation.

Two last procedures require periodical weekly fulfillment by PC users.

**Appendix 3.1.**

**SUBSEQUENT INTERVIEW FORM**

**Draft 16.12.98**

*Patient's bar-code*

1. *Date of inquiry*: Day ☐☐ Month ☐☐ Year ☐☐

2. *Code of questioned person*:
Self-examined ☐
Mother ☐ Son, daughter ☐
Father ☐ Other relatives ☐
Sister, brother ☐ Others ☐

3. *Surname of subject*:

*Surname at the time of the accident*:

4. *First name of subject*:

5. *Patronymic of subject*:

6. *Date of birth*: Day ☐☐ Month ☐☐ Year ☐☐

7. *Sex* : male ☐ female ☐

8. *CURRENT HOME ADDRESS*:

OBLAST

RAYON

SELSOVET

SETTLEMENT

STREET/HOUSE/APPT

PHONE

**9.** *Were you, evacuated or moved yourself during the period of April-May 1986?*

yes ❑ no ❑

**10.***How much time did you spend outdoors in spring and summer time before the accident (hours per day)*?

Spring ☐☐ Summer ☐☐

**10a.** *Did you limit the amount of time you spent outdoors after the accident, in comparison to your usual habits at this time of the year?* |_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|

yes = 1 ❑ no ❑ (move to i. 11) do not remember ❑ (move to i. 11)

**10b.***When did you limit staying outdoors?*:

Day ☐☐ Month ☐☐

*If exact date is not known, please, chose some from the following*:

end of April ❑ beginning of May ❑

middle of May ❑ end of May and later ❑

**10c.** *For how long did this limitation continue (weeks, days (underline))?* ☐☐

**10d.** *How much time did you spend outdoors during limitation?*

*From* ☐☐ *to* ☐☐

**11.** Did you move out the place of residence in 1986 (because of evacuation, holidays in April-May. Rest, changing the place of residence and soon)?

| Move in 1986 | | | from | to | Code | Address | Time spent outdoors |
|---|---|---|---|---|---|---|---|
| OBLAST | RAYON | SETTLEMENT | Date | Date | | | hour/day |
| | | | / /86 | / /86 | | | |
| | | | / /86 | / /86 | | | |
| | | | / /86 | / /86 | | | |
| | | | / /86 | / /86 | | | |
| | | | / /86 | / /86 | | | |
| | | | / /86 | / /86 | | | |
| | | | / /86 | / /86 | | | |
| | | | / /86 | / /86 | | | |
| | | | / /86 | / /86 | | | |
| | | | / /86 | / /86 | | | |

**12.** *Did you move out the place of residence for more than 24days and change of place of residence in the following years:*

| Where to | | | Year | Address | Duration of |
|---|---|---|---|---|---|
| OBLAST | RAYON | SETTLEMENT | | | staying, month |
| | | | 19 | | |
| | | | 19 | | |
| | | | 19 | | |
| | | | 19 | | |
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| | | | 19 | | |
| | | | 19 | | |

**13.** *Iodine prophylaxis carried out in April-May 1986:*

yes ❑ no ❑ (move to i. 14)

do not remember ❑ *( move to i. 14)*

**13a.** *Kind of iodine preparation:*

| | |
|---|---|
| *antistrumine* | ❑ (white small pill sweet) |
| thyroidine | ❑ (small pill sweet) |
| thyroxin | ❑ (white small pill) |
| iodinealcohol solution | ❑ (iodine for wounds treatment) |
| some drops of iodine with water or milk | ❑ |
| iodine to the skin | ❑ |
| lugol solution | ❑ |
| KI | ❑ |
| do not remember | ❑ |

**13b.** *How many times did you take iodine preparations?*

Days, when you take iodine approximately

***April-May 1986***

| MO | Tu. | we | Th. | Fr | sa | su |
|---|---|---|---|---|---|---|
| | | | | | 26 | 27 |
| 28 | 29 | 30 | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | 31 | |

**13c.** *Who conducted the iodine prophylaxis?*

Independently ❑ local physicians ❑

in the place of evacuation ❑ physicians in hospital ❑

**14.** *Milk consumption before you knew about the accident:*

| | ***Codes*** |
|---|---|
| *Milk:(K1)* | *cow = 1*<br>*goat = 2*<br>*mother = 3; milk blend =4*<br>*powder milk =5* |
| *Source:(K2)* | *from private farm = 1*<br>*from local dairy = 2*<br>*from store = 3*<br>*in preventive clinic = 4* |
| *How often: (K3):* | every day = 1<br>few times a week = 2<br>few times a month = 3<br>did not consumt = 4 ❑ (start i. 17a) |

| *Milk (code K1)* | *Source (code K2)* | *Settlement* | *Liters per one consumption* | *Times per day* | | *How often (code K3)* |
|---|---|---|---|---|---|---|
| | | | | *from* | *to* | |
| | | | |_|_,_|_| | | | |
| | | | |_|_,_|_| | | | |
| | | | |_|_,_|_| | | | |

**14a.** *Did you change consumption of milk in April-May 1986*

*yes* ❑ *no* ❑ *(start i.14c)* *do not remember* ❑ *(start i.14c)*

*Using suggested codes put into the table information of milk consumption in the period of April-May 1986*

| | ***Codes*** |
|---|---|
| *Milk:(K1)* | *cow = 1*<br>*goat = 2*<br>*mother = 3; milk blend =4*<br>*powder milk =5* |
| *Source:(K2)* | *from private farm = 1*<br>*from local dairy = 2*<br>*from store = 3*<br>*in preventive clinic = 4* |

| | |
|---|---|
| *How often: (K3):* | every day = 1<br>few times a week = 2<br>few times a month = 3 |
| *Period following the accident): (K4)* | end of April = 1<br>beginning of May = 2<br>mid of May = 3<br>end of May, June = 4 |

| *Milk (code K1)* | *Source (code K1)* | *Settlement* | *Date (from-to) (if exact date is unknown put K4 code)* | | | *Liters per one consumption* | *Times per day* | | *How often (code K3)* |
|---|---|---|---|---|---|---|---|---|---|
| | | | *from* | *to* | *code* | | *from* | *to* | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**14b.** *Put the date of milk consumption ceasing: __/__/86*

If exact date is unknown chose appropriate variant from given below

*end of April* ❑ *beginning of May* ❑

*mid of May* ❑ *end of May and later* ❑ *do not remember* ❑

**14c.** *Put the starting date of cattle pasturing: __/__/86*

If exact date is unknown chose appropriate variant from given below

*end of April* ❑ *beginning of May* ❑

*mid of May* ❑ *end of May and later* ❑ *do not remember* ❑

**15.** *Did you consume your mother's milk in April-May 1986?*

yes ❑ no ❑ (start i.16)

**15a.** *When breast feeding has been completed:* Day Month

☐☐ ☐☐

If exact date is unknown chose appropriate variant from given below

*end of April* ❑ *beginning of May* ❑

*mid of May* ❑ *end of May and later* ❑ *do not remember* ❑

**16.** *Consumption of milk products (food) in April-May 1986?*

yes ❑ no ❑ (start i.17)

do not remember ❑ (start i.17)

**16a.** *Consumption of milk food after the accident April-May 1986:*

| **Food** | **Times per day** | | **Times per week** | | **Amount per one consumption** | **Unit of measure** |
|---|---|---|---|---|---|---|
| | **from** | **to** | **from** | **to** | | |
| milk soup (kasha) | | | | | | |
| kefir | | | | | | |
| baked milk | | | | | | |
| sour cream | | | | | | |
| soft cheese | | | | | | |
| butter | | | | | | |

**17.** *Consumption of green leafy vegetables in April-May 1986:*

yes ❑ no ❑ *(start i. 18)*

do not remember ❑ (start i.18)

**17a.** *From the listed below, please, choose the right answer and put it into the table):*

| *Codes* | |
|---|---|
| *Green leafy vegetable (K1)* | *parsley, dill = 1*<br>*lettuce = 2*<br>*sorrel = 3*<br>*spring onions = 4* |
| *Source (K2)* | *locally produced = 1*<br>*trucked in = 2* |
| *Period after the accident (K3)* | *end of April = 1*<br>*beginning of May = 2* |

| | |
|---|---|
| | *middle of May = 3*<br>*end of May = 4* |
| *How often (K4)* | *every day = 1*<br>*a few times a week = 2*<br>*a few times a month = 3* |

| *Green leafy vegetable (K1)* | *From what source (K2)* | *Settlement* | *Date (from-to) (if exact date is unknown put K3 code)* | *Amount* | *How often (K4)* |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

**18.** *You casual daily food allowance (current)*:

|__|__|litters of milk |__|__|__|__|grams of potato |__|__|__|__|grams of meat

**18a.***Do you eat local mushrooms regularly*:

yes ❑ no ❑

**19.** Did you undergo regular roentgenologic and fluoroscopic examinations?

yes ❑ starting what year |__|__|__|__| no ❑

**19a.** Did you undergo roentgenologic specialized examination:

yes ❑ no ❑ (start i.20)

**19b.**How often?

| Codes | Head(1) | Neck(2) | Teeth(3) | Breast(4) |
|---|---|---|---|---|

| Organ | Number of films or examinations | When (month) | When (year) | Where (medical facility, settlement) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**20.** Did you undergo diagnostic examination with the use of radiopharmaceuticals

yes ❑ no ❑ (start i. 21)

**20a.** How often?

| Codes | Thyroid(1) | Kidneys(2) | Liver(3) | Urinary bladder(4) |
|---|---|---|---|---|

| Organ | When (month) | When (year) | Where (medical facility, settlement) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**21.** Did you undergo radiation treatments?

yes ❑ no ❑

**21a.** When and where

| When | | Where (medical, facility, settlement) |
|---|---|---|
| month | year | |
| | | |
| | | |
| | | |

***Interview was conducted by:*** Full name of specialist

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | | | | |

Estimation of the quality of the interview in completeness and accuracy from the point of view of the specialist is made by the specialist him/herself

good ❑

satisfactory ❑

unsatisfactory ❑

Code

Expert review: Expert-QC ❑|_|_|_|

Expert-specialist ❑|_|_|_|

Dozimetry Group Leader ❑|_|_|_|

Comments ❑

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |

Entered to the DB ❑ Operator's code |_|_|_|

**Appendix 3.2**

**Subsequent Individual Interview Form**
***Instruction for filling in***

***Subsequent Individual Interview Form is completed by interviewer during subsequent interview of examinee ("E") and his accompanies. Given form is designed for clarification of information of the previous interview.It is planed to conduct subsequent interviews till the complete answers to all suggested questions will be received. At present information of previous interviews is on the paper forms. It is pnanned that in future interviewer will have access to all necessary information in computer DB.***

*Procedure of interview.*

1. *Put the date of interview.*
2. *Mark with "×" symbol participants of interview.*
3. *Put family name of "E". If at the time of the accident "E" had another family name, put it below.*
4. *Put the name of "E".*
5. *Put the patronymic of "E".*
6. *Put the date of birth of "E".*
7. *Mark with "×" symbol sex of "E".*
8. *Put detailed current address of "E". Do not make any comments on right fields regarding from what time "E" reside given address.*

Questions 9-21
Will be asked in cases:
1) no answer
2) incomplete answer
3) "do not remember"

**9. Mark with "x", if "e" was evacuated (moved him/herself) from the place of residence (place of staying at the time of accident) in the period** 26.04 - 31.05.86.

**10. Put how many hours 'e' usually spent outdoor in spring and summer period before the accident.**

**If "e" suggests as an answer interval estimation of time of staying outdoor, put it correspondingly to fields "from" and "to".**

**If "e" suggests as an snswer exact number of hours of outdoor staying put it to field "from", field 'to' will be empty.**

10a. **Mark with "x"symbol appropriate variant of answer**

Do not suggest to 'e' variant "do not remember" as a possible answer.

10b. **If 'e' could remind more or less exact date when staying outdoors was limited put it.**

**If for 'e' it is difficult to remind exact date, mark appropriate variant with "x"symbol.**

10c. **During what period this limitation continued. Do not forget to record in what units 'e' mentioned the term (days, weeks).**

10d. **Put how many hours 'e' usually spent outdoor in the period of limitation.**

**If "e" suggests as an answer interval estimation of time of staying outdoor, put it correspondingly to fields "from" and "to".**

**If "e" suggests as an answer exact number of hours of outdoor staying put it to field "from", field 'to' will be empty.**

**11. Put in the table information of "e" movements in 1986 following the accident from the place of residence (place of staying at the time of the accident). Special attention should be**

**paid to the period of** 26.04 -31.05. **It is necessary to record in details the rout of "e" movements in that period including week ends and holidays trips.**

**In the field** "movements in 1986" **put oblast, rajon, settlement (place, if it was summer camp, sanatorium, rest house etc.).**

**In the field** "duration of staying" **should be put the duration of staying in mentioned settlement, i.e. In field"from"put date of arrival (day, month) and in field "to" date of departure (day, month)**

**If "e" can not remind more or less exact date of arrival, interviewer should use suggested code, that should be put to field "code". So code shows approximate date of arrival to given settlement. The date of departure will be the date (code) of arrival to another mentioned settlement etc.**

**If "e" moved to a new place of residence, in the field** "ppr" **put "x". Symbol**

*To the line "**time of staying outdoor**" the information should be put the following way:*

**If "e" suggests as an answer interval estimation of time of staying outdoor, put it correspondingly to field "from" and "to".**

**If "e" suggests as an snswer exact number of hours of outdoor staying put it to field "from", field'to' will be empty.**

12. **Put to the table information of 'e' movements from the place of residence for the period of 24 days and more in the following years.**

**In the field** "where" **put oblast, rajon, settlement (place, summer camp, sanatorium, rest house etc) of movement.**

**In the field** "year of movement" **put the year of movement.**

**If 'e' moved to a new place of residence, in the field**"ppr" **put "x"symbol.**

**In the field** "duration of staying" **put the duration of staying (in months) in the mentioned settlements. If 'e' moved for the period from 24 days to 1 months, consider it as a movement for the term of 1 month.**

**Do not put information of movements for the period of less than 24 days below the table. Do not make any comment on the fields.**

13. **Pay attention that this question deals with the period of** 26.04 - 31.05.86.

13a. **Mark with "x"symbol appropriate variant of answer**

Do not suggest to 'e' variant "do not remember" as a possible answer

13b. **It is necessary to receive from 'e' the following information**

1. **When did 'e' start taking stable iodine;**
2. **Did 'e' take them daily;**
3. **During what period did 'e' take them**

**If 'e' could remind more or less exact starting date of stable iodine intake mark it in the calendar for april-may 1986 it.**

**If for 'e' it is difficult to remind exact date, mark appropriate variant with "x"symbol.**

**Record whether 'e' took stable iodine daily, if no - haw many times a week.**

**Record during what period 'e' took stable iodine do not forget to record in what units 'e' mentioned the term (days, weeks).**

13c. **Mark with "x"symbol appropriate variant of answer**

14. **Pay attention that this question deals with 'e' regular milk consumption before the accident.**

**Using suggested codes put to the table information of milk consumption the following way.**

**In the field** "what milk" **record appropriate variant of k1 code.**

**In the field** "source" **record appropriate variant of k2 code.**

**In the field** "how many liters for one intake" **record the quantity of milk (in liters) that 'e' consumpt for one intake.**

**In the field** "how many times per day" **record how many times per day 'e' consumpt milk**

**In the field** "how often" **record appropriate variant of k3 code.**

14a. **Pay attention that this question deals with 'e' regular milk consumption in the period of** 26.04 - 31.05.86.

**Mark with "*x*"symbol appropriate variant of answer**

Do not suggest to 'e' variant "do not remember" as a possible answer 15à.

**Take into account that answer variant "no" means that'e' continued to drink milk from the same source and in the same quantity during the whole mentioned period.**

**Using suggested codes put to the table information of milk consumption in the period of** 26.04 - 31.05.86 **the following way.**

**In the field** "what milk" **record appropriate variant of k1 code.**

**In the field** "source" **record appropriate variant of k2 code.**

**In the field** "settlement" **. If 'e' in the period of 26.04 - 31.05 moved from the place of residence, this field should correspond to the field "movements in 1986" of 11 item. If 'e' did not moved during the mentioned period, to the field "settlement" put the place of residence.**

**Field** "period of consumption". **This field should reflect changes in milk consumption in the period april-may 1986. The following variants are possible.**

**1. "e" in the period april-may 1986 did not move from the place of residence but quitted milk consumption in the mentioned period. If 'e' could remind more or less exact date of quitting of milk consumption put this date to the field "from" to the field "to" put the date 26.04.86. If for 'e' it is difficult to remind the date, so use suggested k4 code that should be put to the field "code". The code shows approximate date of quitting of milk consumption.**

**2. "e" moved from the place of residence, but quitted milk consumption prior to movement. Information is put the same way as in previous variant.**

**3."e" moved from the place of residence and before movement continued milk consumption. In this case date of quitting of milk consumption is considered as a date of movement.**

**Information of milk consumption in the places to which 'e' moved is put the following way.**

**If "e" consumpted milk, in fields "from" ("code") and "to", correspondingly, information is put corresponding to the date of arrival and departure from the given settlement.**

**If in places ( or in some of them) where 'e' moved 'e' did not consumpt milk, fields "from", "to", and "code" will remain empty.**

**If 'e' quitted milk consumption, to the field "from" date of arrival to given settlement is put, and in the field "to" the date of quitting of milk consumption is put.**

**If for 'e' it is difficult to remind exact date, use suggested k4 code**

**In the field** "how many liters for one intake" **record the quantity of milk (in liters) that 'e' consumpt for one intake.**

**In the field** "how many times per day" **record how many times per day 'e' consumpt milk**

**In the field** "how often" **record appropriate variant of k3 code.**

14b. **Using previous table record the date (correspondingly - code) of quit of milk consumption. It is very important to put the date correctly.**

**What date consider the date of quitting of milk consumption?**

Date of departure **from the place of residence (place of staying at the time of the accident), if «e» consumpted milk before departure and moved outside contaminated area or was taken to summer camp, sanatorium, rest house, etc.**

Date of quitting of milk consumption, **if «e» did not move from the place of residence or quitted milk consumption before movement.**

Starting date of milk substitutes consumption, i.e. **Date when "e" quitted fresh milk consumption and started dry, concentrated or condensed milk.**

14c. **If "e" could remind more or less exact starting date of pasture of home cow (goat) in spring 1986, record this date (day, month.**

**If for "e" it is difficult to remind a date chose the variant from suggested list and mark with "x"symbol appropriate variant of answer**

Do not suggest to 'e' variant "do not remember" as a possible answer

**If 'e' remember that during the period 26.04 - 31.05.86 cow (goat) was not pastured (fed by hay), in this case mark the variant "end of may and later".**

15. **Pay attention that this question deals with the period of** 26.04 - 31.05.86.

**Mark with "x"symbol appropriate variant of answer**

15a. **If 'e' could remind more or less exact date when breast feeding was quitted put this date (day, month).**

**If for 'e' it is difficult to remind exact date, mark appropriate variant with "x"symbol.**

16. **Pay attention that this question deals with the period of** 26.04 - 31.05.86.

**Mark with "x"symbol appropriate variant of answer**

Do not suggest to 'e' variant "do not remember" as a possible answer

16a. **Complete the table the following way.**

**In the field** "type of food staff" **chose those food staffs 'e' consumpted**

**In the fields** "how many times a day" **and** "how many times a week" **record how often 'e' consumpted given food staff**

**If "e" suggests as an answer interval estimation of time of staying outdoor, put it correspondingly to fields "from" and "to".**

**If "e" suggests as an answer exact number of hours of outdoor staying put it to field "from", field 'to' will be empty.**

**In the field** " how much for one consumption" **record how much 'e' consumpted given food staff per one intake and in the field** "units of measurement" **record units of measurement (grams or litters)**

17. **Pay attention that this question deals with 'e' consumption of green leafy vegetables in the period of** 26.04 - 31.05.86. **In the place of residence (place of staying at the time of the accident). Do not consider green leafy vegetables if they were cooked**

**Mark with "x"symbol appropriate variant of answer**

17a. **Fill in the table the following way**

**In the field** "type of green leafy vegetable" **record appropriate variant of k1 code. If 'e' consumpted several types of green leafy vegetables (glv) list them below and put the information to the table separately for each type of glv.**

**In the field** "source of consumpted glv» **record appropriate variant of k2 code. Take into consideration that imported glv means glv bought in a store. It mostly belongs to 'e' who lived in cities. Glv from private farm, dacha, local markets refers to glv of local production.**

**In the field** "starting date of consumption" **put the information the following way.**

**If 'e' could remind more or less exact starting date of consumption of mentioned type of glv, put this date to field 'date'**

**If for 'e' it is difficult to remind date, use suggested k3 code that should be put to field 'code'**

**In the field** "amount of consumpted glv" **record what amount of glv (approximately) 'e' consumpted a day (grams).**

**In field** "how often" **record appropriate k4 code.**

18. **Record regular daily ration (grams) of'e' at present.**

**Do not make comments how many times a week 'e' consumpted given type of staff as question refers to daily ration.**

18a. **It means mushrooms consumption at mushroom period and consumption of cooked mushrooms. Mark with "x" symbol appropriate variant of answer.**

**19.ask whether 'e' undergone annual x-ray or fluorogrpgic examination regularly. Mark with "x" appropriate variant. If the answer is "yes", record from what year.**

19a. **Ask whether 'e' undergone specialized x-ray examination. Mark with "x"symbol appropriate variant. If the answer is "yes", complete the table.**

19b. **Complete the table the following way.**

**In the field "what part of body" record code corresponding to part of body.**

**In the field "when " record month and year when x-ray was made.**

**In the field "where" record medical institution were x-ray was performed.**

20. **Ask whether 'e' undergone diagnostical examination with radio pharmacological preparations (radio pharmacological preparation - is radioactive preparation that is given to the patient for diagnostical purposes, for example, examination of kidneys function, thyroid etc.) Mark with "x" symbol appropriate variant. If "yes", complete the table.**

**20a. Complete the table the following way.**

**In the field** "what body organ" **record code corresponding to body organ.**

***In the field*** *"when"* ***record month and year when 'e' undergone diagnostiacal examination with radio pharmacological preparations.***

**In the field "when" record name of medical institution where radiopharmacological diagnostics was performed**

21. **Ask whether 'e' was subjected to medical exposure with therapeutic reasons. Mark with "x" symbol appropriate variant. If "yes", complete the table.**

21a. **Complete the table the following way.**

**In the field** "when" **record month and year when 'e' was subjected to medical exposure with therapeutic reasons..**

**In the field "when" record name of medical institution where 'e' was subjected to medical exposure with therapeutic reasons**

Strictly follow instruction for filling in interview form

Stay in the framework of suggested form of answers recording, do not make any marks and comments on the fields

*After completion the initial interview form should be passed to*

_____ *and stored in the dosimetry laboratory*

**APPENDIX 3.3**

**Subsequent Interview Form**

*Instruction for data entry.*

*Data entry from paper "Subsequent Interview Form" to computer data base is performed by operator. Data base is implemented in Microsoft Access DBMS. After opening of DB via Microsoft Access a window will appear on the screen with two fields for entry:* ***Name*** *and* ***Password****. To open DB operator should enter his/her name and personal password. After keying of password a window will appear on the screen* ***Screening Data Entry, chose the button "Subsequent individual Interview"****. Furthermore on the window* ***Enter patient's code*** *enter indentificational code of the subject and date of interview (day, month, year). Data entry form will appear on the screen. Number, name, numeration of fields in the data entry form corresponds to Subsequent Individual Interview Form.*

*Procedure of data entry.*

*1.* ***Date of interview.*** *Entered. Check correctness of entry.*

*2.* ***Participants of interview.*** *To mark the participants of interview put mouse pointer to appropriate variant of answer and click mouse button.*

*3.* ***Surname of subject*** *and* ***Surname at the time of accident.*** *Entered from initial form. Check correctness of entry.*

*4.* ***First name of subject.*** *Entered from initial form. Check correctness of entry.*

*5.* ***Patronymic.*** *Entered from initial form. Check correctness of entry.*

*6.* ***Date of birth.*** *Enter to the field the date (day, month, year).*

*7.* ***Sex.*** *To enter sex put mouse pointer to the button of variants and click the mouse. Choose necessary sex. Your choice will be entered to the window.*

*8.* ***Current home address.*** *In the field* ***Oblast*** *call for list of oblasts. To do this put mouse pointer to the button of variants and click the mouse. Choose necessary oblast. Your choice will be entered to the window of given field. In the field* ***Rajon*** *call for list of rajons. From suggested list chose appropriate rajon. . In the field* ***Settlement*** *call for list of settlements. From suggested list chose appropriate settlement. To the fields,* ***Street, House, Building, Apartment, Phone*** *text information is keyed.*

*If at present subjects lives outside Belarus put his/her address in field* ***Address outside Belarus*** *as text information.*

*9.* ***Were you evacuated or moved yourself during the period of April- May 1986*** *Choose appropriate variant.*

10. How much time did you spend outdoors before the accident. **To the fields** From **and** To **numeric information is entered.**

10a. Did you limit the amount of time you spent outdoors after the accident. **Choose appropriate variant of answer.**

10b. When did you limit staying outdoors. **To the fields** From **and** To **numeric information is entered. If exact date is unknown chose appropriate variant of answer**

10c. For how long did this limitation continue. **Put numeric information and units of measurement (days or weeks)**

10d. How much time did you spent outdoors during limitation. **To the fields** From **and** To **numeric information is entered.**

*In the field* ***Estimation (Item 14-14d))*** *call for list of estimates. Choose appropriate one from suggested list..*

*11.* ***Migrations from the place of residence in 1986.*** *To enter the information into the fields* ***Oblast, Rajon, Settlement, Place of rest*** *use the button of pictogram with envelope. A window will appear on the screen* ***Address entry****. In the field* ***Oblast*** *call for list of oblasts.. Chose necessary*

*rajons. From suggested list chose appropriate rajon. . In the field* ***Settlement*** *call for list of settlements. From suggested list choose appropriate settlement. To the field* ***Place of rest in Belarus*** *text information is keyed. To exit from the window press* ***OK*** *button.*

*Movements outside Belarus in 1986 are entered into the* ***Àddress (outside Belarus)*** *as text information.*

***Duration of staying****. Date of arrival (day, month, year) is entered into the field* ***From****, Date of departure is entered into the field* ***To****. To the field Code numerical information is entered..*

*If subject moved to new place of residence point it in the field* ***Place of Residence***

***12. Movement outside place of residence for more than 24 days and change of place of residence in the following years.*** *Pay attention! You should not enter information from the field of the table* ***Where to (Oblast, Rajon, Settlement)***

*Into the field* ***Year*** *numerical information is entered*

**If subject moved to a new place of residence point it in the field** Place of residence

**Into the field** Duration of staying **numerical information is entered.**

***13. Iodine prophylaxis carried out in April-May 1986*** *Choose appropriate variant of answer.*

***13a. Kind of iodine preparation.*** *Choose appropriate variant of answer.*

***13b. Point the date when you started taken iodine preparations. To the field a date is entered. If exact date is unknown chose appropriate variant of answer.***

***How often.*** *Choose appropriate variant. If answer* ***several times a week,*** *into the field* ***How many times enter numeric information.***

During what period of time did you take iodine preparations. **Put numeric information and corresponding unit of measurement (days or weeks)**

***13c. Who conducted the iodine prophylaxis.*** *Choose appropriate variant.*

*In the field* ***Estimation (Item 15-15ñ )*** *call for list of estimates. Choose appropriate one from suggested list..*

**14. Using suggested codes fill into the table information of milk consumption before the accident** Numerical information is entered to all fields of the table

***14a. Did you change consumption of milk in April-May 1986 1986.*** *Choose appropriate variant of answer.*

***Using suggested codes put to the table information of milk consumption in the period of April-May 1986.*** *To the fields* ***What milk (code K1)*** *and* ***Source (code K2)*** *numerical information is entered. In the Field* ***Settlement*** *text information is entered. Into the fields* ***From and To Terms of milk consumption*** *date is entered (day, month, year), into the field* ***code*** *– numeric information. Into the field* ***Litters per one consumption, Times per day,How often*** *numeric information is entered.*

***14b. Date of quitting of milk consumption.*** *To the field a date is entered (day, month, year) If exact date is unknown chose appropriate variant of answer.*

***14c. Starting date of cattle pasturing in 1986.*** *To the field a date is entered (day, month, year) If exact date is unknown chose appropriate variant of answer*

***15. Did you consume breast milk in April-May 1986.*** *Choose appropriate variant of answer*

***15a. When breast feeding was quitted To the fields*** *Day and Month* ***numeric information is entered. If exact date is unknown choose appropriate variant of answer***

*In the field* ***Estimation (Item 16-17a)*** *call for list of estimates. Choose appropriate one from suggested list..*

***16. Consumption of milk products in April-May 1986.*** *Choose appropriate variant of answer*

16a. Complete the table with the following information. **In to the field** food **call for list of food staffs. From suggested list choose corresponding food staffs. In the field** units of measurement **call for list of units of measurement. Choose appropriate units of measurement.**

**In the rest fields of table enter numeric information**

In the field **Estimation (Item** 18-18à) call for list of estimates. Choose appropriate one from suggested list..

17. Consumption of green leafy vegetables (glv) in April-May 1986. **Choose appropriate variant of answer**

***17a. Using suggested codes put the information of consumption of glv in April-May 1986 into the table.*** *Into all fields of table, except field* ***Date*** *numerical information is entered. Into the field* ***Date*** *date is entered (day, month, year)*

***18.*** *Your casual daily food allowance(current). Into all fields numerical information is entered*

***18a. Did you eat local mushrooms*** *Chose appropriate variant of answer*

*To start the next group of questions use pictogram* ***i.21_24.***

***19. Did you undergo regular x-ray or fluoroscopic examination*** *Choose appropriate variant. If* ***Yes,*** *into the field* ***Starting what year*** *enter numeric information*

***19a. Did you undergo x-ray specialized examination.*** *Choose appropriate variant*

***19b. How many times.*** *Into the fields* ***Organ, Month,***
***Year*** *numerical information is entered. Into the field* ***Where*** *text information is entered.*

20. Did you undergo diagnostic examination with the use of radiopharmaceuticals. **Choose appropriate variant.**

***20a. How many times.*** *Into the fields* ***Organ, Month,***
***Year*** *numerical information is entered. Into the field* ***Where*** *text information is entered*

***21. Did you undergo radiation treatment*** *Choose appropriate variant*

***21a. When and where did you undergo radiation treatment.***. *Into the fields* ***Month*** *and* ***Year numerical information in entered.*** *Into the field* ***Where*** *text information is entered*

*Into the field* ***Interview was conducted by*** *surname of interviewer is*

**In the field** quality estimation of conducted interview **call for list of estimates. Choose appropriate one from suggested list.**

**Exit from the data entry form saving entered information is performed via** Exit **button located in upper right corner of screen.**

**Exit without saving of entered information is performed via** Cancel **button.**

**Entry of the next form is performed via** Choose subject. **Button.**

**Appendix 4.1.**

F(T) function for 12 variants of $^{131}I$ intake to thyroid.

- Inhalative penetration to thyroid

  F(T)= Exp(L_Th(T) * T_m) / L_Th(T)

when *Exp* – exponential function;

*L_Th(T)* – effective loss constant of $^{131}I$ in thyroid, $d^{-1}$, age dependent values of thyroid mass are presented in Table 24.1

*T_m* – time interval between the date of subject measurement and the starting date of $^{131}I$ fallouts, d.

- Per oral penetration of $^{131}I$ with milk during the whole iodine period

```
F(T) = Exp(L_Th(T) * T_m) / L_Th(T) * (1 / L_c - 1 / L_g) /
       (1 / (L_c - L_Th(T)) * (1 - Exp(-(L_c - L_Th(T)) * T_m)) -      (5)
        1 / (L_g - L_Th(T)) * (1 - Exp(-(L_g - L_Th(T)) * T_m)))
```

when *L_c*=0.63 – constant of biological half decontamination of milk from $^{131}I$, $d^{-1}$,

*L_g*=0.15 – constant of grass decontamination from $^{131}I$, $d^{-1}$,

- Per oral penetration of $^{131}I$ with milk without break while taking stable iodine (date of thyroid dose rate measurement is less or equal to the starting date of iodine prophylaxis):

```
F(T) = Exp(L_Th(T) * T_m) / L_Th(T) *
       (1 / L_c * (1 - Exp(-L_c * T_b) + Exp(-L_c * T_e)) -
        1 / L_g * (1 - Exp(-L_g * T_e))) /
       (1 / (L_c - L_Th(T)) * (1 - Exp(-(L_c - L_Th(T)) * T_m)) -
        1 / (L_g - L_Th(T)) * (1 - Exp(-(L_g - L_Th(T)) * T_m)))
```

when *T_b* – time interval between starting date of iodine prophylaxis for cohort subject and starting date of fallouts $^{131}I$, d.

*T_e* – time interval between final date of iodine prophylaxis for cohort subject and starting date of fallouts $^{131}I$, d

- Per oral penetration of $^{131}I$ with milk without break while taking stable iodine (date of thyroid dose rate measurement is more than starting date of iodine prophylaxis but less or equal to the final date of iodine prophylaxis):

```
F(T) = Exp(L_Th(T) * T_m) / L_Th(T) *
       (1 / L_c * (1 - Exp(-L_c * T_b) + Exp(-L_c * T_e)) -
        1 / L_g * (1 - Exp(-L_g * T_b) + Exp(-L_g * T_e))) /
       (1 / (L_c - L_Th(T)) * (1 - Exp(-(L_c - L_Th(T)) * T_b))
        1 / (L_g - L_Th(T)) * (1 - Exp(-(L_g - L_Th(T)) * T_b)))
```

- Per oral penetration of $^{131}I$ with milk without break while taking stable iodine (date of thyroid dose rate measurement is more than the final date of iodine prophylaxis):

```
F(T) = Exp(L_Th(T) * T_m) / L_Th(T) *
       (1 / L_c * (1 - Exp(-L_c * T_b) + Exp(-L_c * T_e)) -
        1 / L_g * (1 - Exp(-L_g * T_b) + Exp(-L_g * T_e))) /
       (1 / (L_c - L_Th(T)) * (1 - Exp(-(L_c - L_Th(T)) * T_b) +
        Exp(-(L_c - L_Th(T)) * T_e) - Exp(-(L_c - L_Th(T)) * T_m)) -
        1 / (L_g - L_Th(T)) * (1 - Exp(-(L_g - L_Th(T)) * T_b) +
        Exp(-(L_g - L_Th(T)) * T_e) - Exp(-(L_g - L_Th(T)) * T_m)))
```

- Per oral penetration of $^{131}I$ with milk was broken because of lack of iodine prophylaxis (date of thyroid dose rate measurement is less or equal to the ceasing date of milk consumption):

```
F(T) = Exp(L_Th(T) * T_m) / L_Th(T) *
       (1 / L_c * (1 - Exp(-L_c * T_s)) -
        1 / L_g * (1 - Exp(-L_g * T_s))) /
       (1 / (L_c - L_Th(T)) * (1 - Exp(-(L_c - L_Th(T)) * T_m)) -
        1 / (L_g - L_Th(T)) * (1 - Exp(-(L_g - L_Th(T)) * T_m)))
```

when *T_s* – time interval between ceasing date of milk consumption for cohort subject and starting date of fallouts $^{131}I$ ,d.

- Per oral penetration of $^{131}I$ with milk was broken while taking stable iodine (date of thyroid dose rate measurement is less or equal to the ceasing date of milk, date of thyroid dose rate measurement is less or equal to the starting date of iodine prophylaxis):

```
F(T) = Exp(L_Th(T) * T_m) / L_Th(T) *
       (1 / L_c * (1 - Exp(-L_c * T_b) + Exp(-L_c * T_e) –
        Exp(-L_c * T_s)) - 1 / L_g * (1 - Exp(-L_g * T_b) +
        Exp(-L_g * T_e) - Exp(-L_g * T_s))) /
       (1 / (L_c - L_Th(T)) * (1 - Exp(-(L_c - L_Th(T)) * T_m)) -
        1 / (L_g - L_Th(T)) * (1 - Exp(-(L_g - L_Th(T)) * T_m)))
```

- Per oral penetration of $^{131}I$ with milk was broken while taking stable iodine (date of thyroid dose rate measurement is less or equal to the ceasing date of milk; date of thyroid dose rate measurement is more than starting date of iodine prophylaxis but less or equal to the final date of iodine prophylaxis):

```
F(T) = Exp(L_Th(T) * T_m) / L_Th(T) *
       (1 / L_c * (1 - Exp(-L_c * T_b) + Exp(-L_c * T_e) –
        Exp(-L_c * T_s)) - 1 / L_g * (1 - Exp(-L_g * T_b) +
        Exp(-L_g * T_e) - Exp(-L_g * T_s))) /
       (1 / (L_c - L_Th(T)) * (1 - Exp(-(L_c - L_Th(T)) * T_b)) -
        1 / (L_g - L_Th(T)) * (1 - Exp(-(L_g - L_Th(T)) * T_b)))
```

- Per oral penetration of $^{131}I$ with milk was broken while taking stable iodine (date of thyroid dose rate measurement is less or equal to the ceasing date of milk; date of thyroid dose rate measurement is more than the final date of iodine prophylaxis )

```
F(T) = Exp(L_Th(T) * T_m) / L_Th(T) *
       (1 / L_c * (1 - Exp(-L_c * T_b) + Exp(-L_c * T_e) –
        Exp(-L_c * T_s)) - 1 / L_g * (1 - Exp(-L_g * T_b) +
        Exp(-L_g * T_e) - Exp(-L_g * T_s))) /
       (1 / (L_c - L_Th(T)) * (1 - Exp(-(L_c - L_Th(T)) * T_b) +
        Exp(-(L_c - L_Th(T)) * T_e) - Exp(-(L_c - L_Th(T)) * T_m)) -
        1 / (L_g - L_Th(T)) * (1 - Exp(-(L_g - L_Th(T)) * T_b) +
        Exp(-(L_g - L_Th(T)) * T_e) - Exp(-(L_g - L_Th(T)) * T_m)))
```

- Per oral penetration of $^{131}I$ with milk was broken without taking stable iodine (date of thyroid dose rate measurement is more than ceasing date of milk consumption):

```
F(T) = Exp(L_Th(T) * T_m) / L_Th(T) *
       (1 / L_c * (1 - Exp(-L_c * T_s)) - 1 / L_g * (1 - Exp(-L_g * T_s))) /
       (1 / (L_c - L_Th(T)) * (1 - Exp(-(L_c - L_Th(T)) * T_s)) -
        1 / (L_g - L_Th(T)) * (1 - Exp(-(L_g - L_Th(T)) * T_s)))
```

- Per oral penetration of $^{131}I$ with milk was broken while taking stable iodine (date of thyroid dose rate measurement is more than ceasing date of milk consumption; final date of iodine prophylaxis is less or equal to ceasing date of milk consumption)

```
F(T) = Exp(L_Th(T) * T_m) / L_Th(T) *
       (1 / L_c * (1 - Exp(-L_c * T_b) + Exp(-L_c * T_e) –
        Exp(-L_c * T_s)) – 1 / L_g * (1 - Exp(-L_g * T_b) +
        Exp(-L_g * T_e) - Exp(-L_g * T_s))) /
       (1 / (L_c - L_Th(T)) * (1 - Exp(-(L_c - L_Th(T)) * T_b) +
        Exp(-(L_c - L_Th(T)) * T_e) - Exp(-(L_c - L_Th(T)) * T_s)) -
        1 / (L_g - L_Th(T)) * (1 - Exp(-(L_g - L_Th(T)) * T_b) +
        Exp(-(L_g - L_Th(T)) * T_e) - Exp(-(L_g - L_Th(T)) * T_s))) (10)
```

- Per oral penetration of $^{131}I$ with milk was started when subject arrived to contaminated area after fallouts had begun, and then it was broken.

```
F(T) = Exp(L_Th(T) * T_m) / L_Th(T) *
       (1 / L_c * (Exp(-L_c * T_1) - Exp(-L_c * T_s)) -
        1 / L_g * (Exp(-L_g * T_1) - Exp(-L_g * T_s))) /
       (1 / (L_c - L_Th(T)) * (Exp(-(L_c - L_Th(T)) * T_1) –
        Exp(-(L_c - L_Th(iAge)) * T_s)) -
        1 / (L_g - L_Th(T)) * (Exp(-(L_g - L_Th(T)) * T_1) –
        Exp(-(L_g - L_Th(T)) * T_s)))
```

when *T_1* – time interval between the date subject arrival to contaminated area and starting date of fallouts $^{131}I$ , d.

**Appendix 4.2.**

**Таблица А.1.**

**Table Pacients**

| Table field | Type of field | Items | Description of field . | Conditions, description of codes, |
|---|---|---|---|---|
| ID (key field) | Text (20) | | Bar code of patient and date of interview | Obligatory field |
| PacientID | Integer | | Bar code of subject | Obligatory field |
| Birthday | Date/Time | 6 | Date of birth | |
| OblastCode_Av | Integer | 9 | Address at the time of the accident (Oblast) | From ref. book «Oblast» |
| RayonCode_Av | Integer | 9 | Address at the time of the accident (Rajon) | From ref. book «Raion» |
| Ssoovet_Av | Text (25) | 9 | Address at the time of the accident (Selsovet) | |
| City_Av | Text (25) | 9 | Address at the time of the accident (Settlement) | |
| IodProphylaxisAsk | Integer | 15 (16) | If iodine propfilaxis was conducted in1986 | 1 – yes<br>2 – no<br>3 – don't remem |
| MilkAfterAvAsk | Integer | 16a (17a) | If milk consumption has been changed following the accident | 1 – yes<br>2 – no<br>3 – don't remem |
| StopDateMilkConsumption | Date/Time | 166 | Exact date of milk consumption ceasing | > 25.04.86 and < 01.06.87 |
| StopDateMilkConsumptionUnknown) | Integer | 166 | If exact date is unknown chose one of 5 variants | 1 – End Apr.,<br>2-Beg. Of May,<br>3-Mid. Of May<br>4-End of May.,<br>5- Do not reme |
| StartDateCowPasture | Date/Time | 16c | Exact starting date of catle pasturing | > 25.03.86 and < 15.06.86 |
| StartDateCowPasture Unknown | Integer | 16c | If exact date is unknown chose one of 5 variants | 1 – End Apr.,<br>2-Beg. Of May,<br>3-Mid. Of May<br>4-End of May.,<br>5- Do not reme |

**Table A.2.**

**Table Departure86,**

| Table field | Type of field | Анк. | Description of field . | Conditions, description of codes, |
|---|---|---|---|---|
| ID | Text (20) | | Key field for link with Pacients table | Obligatory field |
| Region86 (Oblast) | Integer | 11 (12) | Movement in 1986 Oblast | From ref. book «Oblast» |
| District86 (Rajon) | Integer | 11 (12) | Movement in 1986 Rajon | From ref. book «Rajon» |
| Place86 (Settlement) | Text (25) | 11 (12) | Movement in 1986 Settlement | |
| Place86_Other | Text (30) | 11 (12) | Movement in 1986 other places (summer camp, sanatorium) | |
| Departure86DateSince | Date/Time | 11 | Date of arriving to the place of temporate staying | >25.04.86 and < 01.01.87 |
| Arrival86DateIn (to ) | Date/Time | 11 | Date of leaving in 1986 place of temp, staying | >25.04.86 and < 01.01.87 |
| DepArr86DateCode (codes of staying) | Integer | 11 | If exact dae is unknown use codes. | 1 – End Apr., 2-Beg. Of May, 3-Mid. Of May 4-End of May., 5- Do not reme |
| ConstantResidence | Text(5) | 11 | Coming to a new place of residence | |
| Number86 | counter | | Special field for estimation of records. | |

**TableA.3.**

**Table IodineProphylaxis**

| Table field | Type of field | Items | Description of field . | Conditions, description of codes, |
|---|---|---|---|---|
| ID | Text (20) | | Key field for link with Pacients table | Obligatory field |
| StartDateIodineIntake | Date /Time | 166 | Starting date of iodine intake | >25.04.86 and < 31.06.86 |
| RooghDate1) | Logical | 156 (16c) | Approximate date (period of intake - V 1.0) end of april | |
| RooghDate2) | Logical | 156 (16c) | Approximate date (period of intake - V 1.0) begin of May | |
| RooghDate3) | Logical | 156 (16c) | Approximate date (period of intake - V 1.0) mid of May | |
| RooghDate4 | Logical | 156 (16c) | Approximate date (period of intake - V 1.0) end of May | |
| IodineIntakeEveryDay | Logical | 156 | Frequency of intakes, dayly? | |

| | | | | |
|---|---|---|---|---|
| IodineIntakePerWeek | Logical | 156 | Frequency of intakes per week? | |
| IodineIntakeHowMuch | Integer | 156 | Frequency of intakes How many times | |
| TimeDurIodineIntake | Integer | 156 | Period of intake , days, weeks | |
| TimeDurIodineUnit | Integer (Байт) | 156 | Units of duration (days, week), check buttons or combo box. | 1 –weeks, 2 – days (default) |
| IodinProphylaxisWho 1 | Logical | 15с 16ф | Who conducted iodine proph. himself | |
| IodinProphylaxisWho 2) | Logical | 15с 16ф | Who conducted iodine proph local physicians | |
| IodinProphylaxisWho 3 | Logical | 15с 16ф | Who conducted iodine proph at place of evacuation | |
| IodinProphylaxisWho 4 | Logical | 15с 16ф | Who conducted iodine proph Physicians in hospital | |

**Table A.4.**

**Table Iodine_Pod_Calend,**

| Table field | Type of field | Анк. | Description of field . | Conditions, description of codes, |
|---|---|---|---|---|
| ID | Text (20) | | Key field for link with Pacients table | Obligatory field |
| Date_Iod | Date/Time | 166 | Date of iodine intake | |

**Table A.5.**

**Table MilkBeforeAv**

| Table field | Type of field | Анк. | Description of field . | Conditions, description of codes, |
|---|---|---|---|---|
| ID | Text (20) | | Key field for link with Pacients table | Obligatory field |
| NumberMilkBefAv | Integer | | # of record for single ID together with ID field form a combined key. | Obligatory field |
| MilkType | Integer | 16 (17) | Kind of milk. | According to interview |
| MilkSource | Integer | 16 (17) | Source of milk | According to interview |
| LitrsPerTaking Num | Integer | 16 | Littres per one intake | |
| TimesPerDayNum | Integer | 16 | How many times per day | |
| HowOften | Integer | 16 (17) | How often | According to interview |

**Table A.6.**

**Table MilkAfterAv,**

| Table field | Type of field | Анк. | Description of field . | Conditions, description of codes, |
|---|---|---|---|---|
| ID | Text (20) | | Key field for link with Pacients table | Obligatory field |
| NumberMilkAftAv | Integer | | # of record for single ID together with ID field form a combined key. | Obligatory field |
| MilkType | Integer | 16a 17б | Kind of milk. | Coding |
| MilkSource | Integer | 16a 17б | Source of milk | Coding |
| Place | Text (45) | 16a 17б | Settlement | |
| StartDate (since..) | Date/Time | 16a | Starting date of milk intake | > 25.04.86 and < 01.01.86 |
| DateC4 | Integer | 16a 17б | Period of milk intake | Coding (code 4) |
| EndDate (to..) | Date/Time | 16a | Date of ceasing of milk intake | > 25.04.86 and < 01.01.86 |
| LitrsPerTaking | Integer | 16a | Littres per one intake | |
| TimesPerDay | Integer | 16a | How many times per day | |
| HowOften | Integer | 16a (17б) | How often | Coding |